NETWORK

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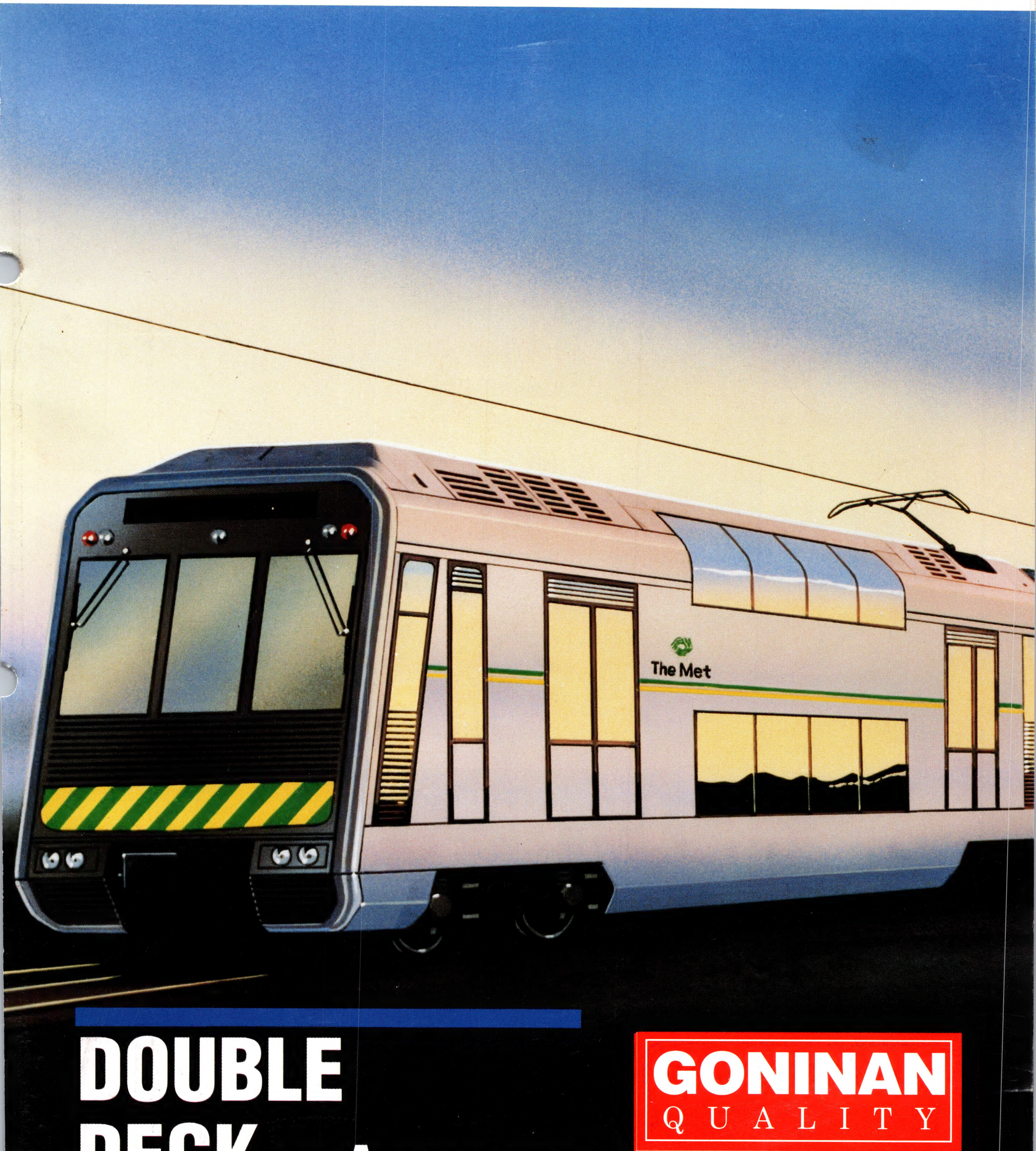

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THE RAILWAYS OF AUSTRALIA QUARTERLY

Volume 29, Number 1
January, February, March 1992

COVER: A. Goninan & Co. Ltd has been contracted to manufacture a Double Deck Development and Demonstration train for the PTC of Victoria to enter service during 1992. The PTC will trial operational and maintenance aspects on the Melbourne suburban system to ensure that the facilities satisfy the needs of the customers. The demonstration train will also be evaluated for its reliability, performance, crew accommodation, maintenance needs and for its ability to work with the existing fleet.

CONTENTS

5 **A NEW ERA IS DAWNING FOR THE INDIAN PACIFIC TRANSCONTINENTAL RAILWAY**

The world-famous railway celebrated its 21st birthday last year. It runs for 4,352 kilometres between Sydney and Perth.

14 **RAIL TRAVEL IN THE STATE OF VICTORIA WILL BE REVOLUTIONISED WITH 22 SPRINTER TRAINS**

With speeds up to 130 km/h, faster and more comfortable travel between Melbourne and inland cities will set new standards in rail transit.

18 **THE NEWLY-FORMED NATIONAL RAIL CORPORATION HAS SELECTED SYDNEY FOR ITS HEADQUARTERS**

Projections for future NRC business determined the choice of a Sydney base. The Corporation will adopt a decentralised structure.

22 **THE VICTORIAN PUBLIC TRANSPORT CORPORATION IS INTRODUCING A COMPUTERISED CONTAINER HANDLING SYSTEM**

A major redevelopment of South Dynon with a three-fold increase in container storage capacity to 725,000 containers a year is underway.

26 **AN AMAZING USE OF SATELLITE NAVIGATION FOR A LEADING PLACE IN WORLD TECHNOLOGY**

The PTC system for recording track information for driver simulators has been developed in conjunction with the University of Melbourne and Sagem Pty Ltd.

30 **BEHIND THE GLASS IN TRAIN WINDOWS AND DOORS IS A FASCINATING STORY OF AUSTRALIAN DESIGN**

Paul Thompson of Beclawat Pty Ltd describes how his company is meeting modern requirements for large expanses of window and now is poised to expand exports.

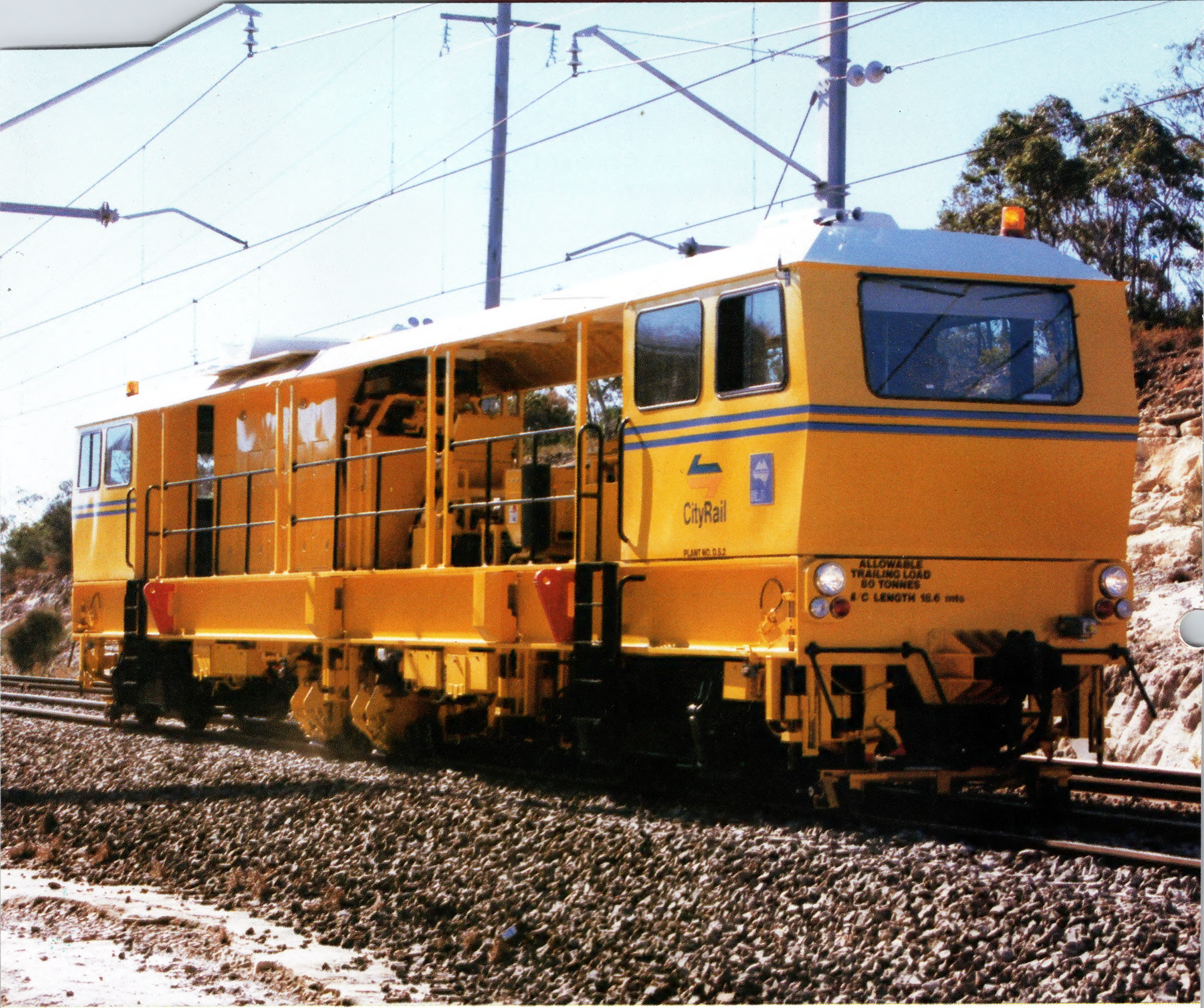
34 **CITYRAIL, THE URBAN NETWORK IN NEW SOUTH WALES, IS INTRODUCING A $450 MILLION SIGNALS UPGRADE CENTRED ON LIVERPOOL**

The new computer-based interlocking system replaces a 70-year-old mechanical lever frame with coloured light and semaphore signals.

50 **OLD ENGINES ARE GETTING A NEW LEASE OF LIFE THROUGH A REMANUFACTURING PROCESS**

Private and public railway systems are taking advantage of this means of fleet renewal as A.C. Brown of A. Goninan & Co. Limited explains.

WINDOWSEAT 41
NEW PRODUCTS & PROCESSES 45
BOOK REVIEWS 48



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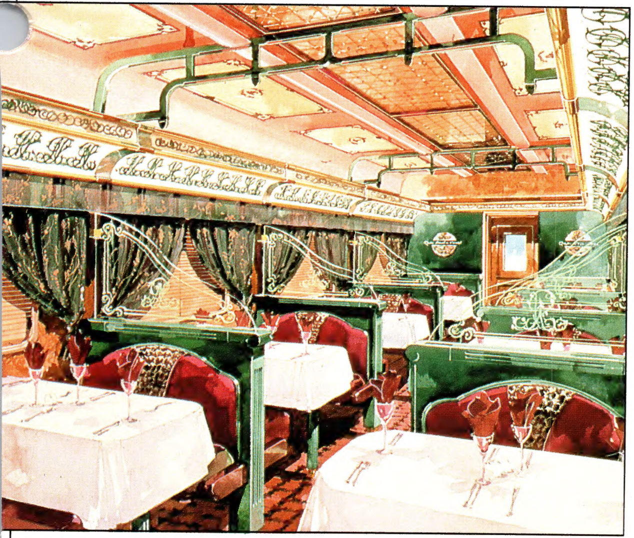
A new era dawning

DEVELOPMENT STRATEGY FOR THE INDIAN PACIFIC

The Queen Adelaide restaurant



The coming-of-age of The Indian Pacific train service from east to west across the Australian continent (it celebrated its 21st birthday last year) has heralded the development of an imaginative master plan for its future into the 21st century.

Australian National, which operates the service, sees it providing world-class comfort and service for passengers equivalent to that found on The Ghan which it operates to Alice Springs.

The Indian Pacific is more than a train, not only a ribbon of steel crossing a continent and joining one vast ocean to another, but also a geographical and historical experience for the tourist traveller. It runs for 4,352 kilometres between Sydney and Perth provides an opportunity to see the wonders of the Australian landscape and to re-live the heroism of the adventurers who opened up the wilderness.

▶

NETWORK

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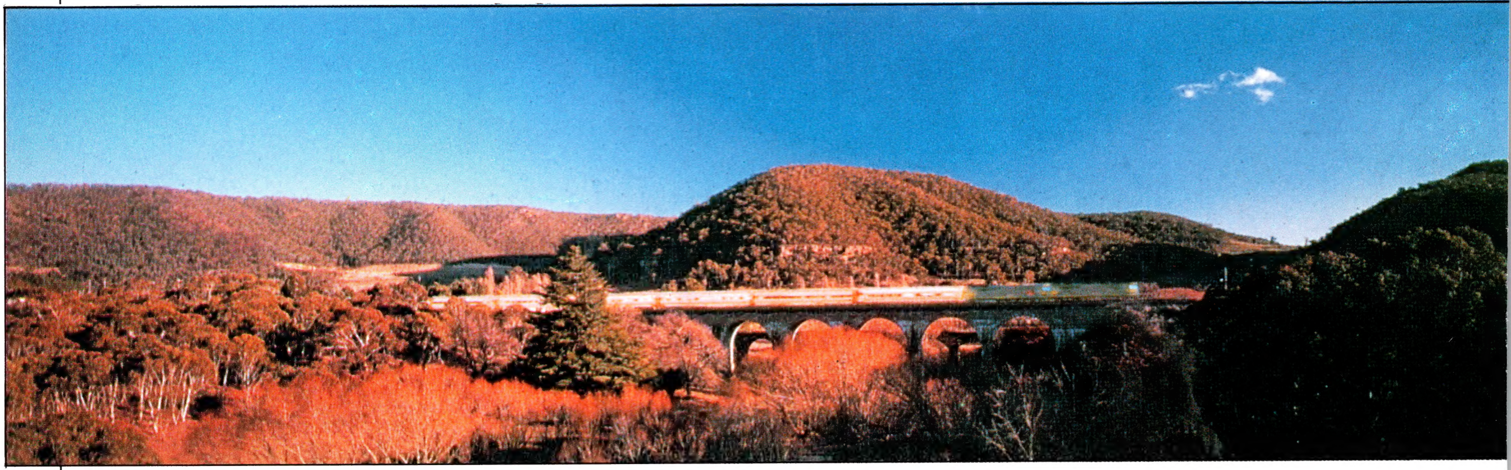


WITH THE SOARING IMAGE OF THE WEDGE-TAIL EAGLE FOR INSPIRATION AUSTRALIAN NATIONAL'S STRATEGY PLAN FOR THE FUTURE DEVELOPMENT OF THE INDIAN PACIFIC PASSENGER RAIL SERVICE LOOKS CONFIDENTLY INTO THE FUTURE.

IT CAPTURES THE TRUE FEELING OF THE AUSTRALIAN CONTINENT FROM THE COASTAL MOUNTAINS AND ROLLING PLAINS TO THE VAST FLAT DESERTS OF THE NATION'S HEART.

A WORLD-CLASS TRANS-CONTINENTAL TRAIN IS PLANNED AT LEAST EQUAL IN STANDARD OF ACCOMMODATION AND SERVICE TO THE NOW-FAMOUS GHAN TO ALICE SPRINGS WHICH IS ALSO OPERATED BY AN.

The train leaves the neon lights of the bustling city of Sydney and slips away across the Blue Mountains with its deep canyons and bold basalt capped hills. Beyond the mountains the great fertile plains unfold and the traveller will experience the earth's response to the precious commodity of rainfall as the train presses on towards the west

Historic Broken Hill with its frontier mining tradition is on the route which leads south to Adelaide cradled between the hills and the Southern Ocean.

North to Port Augusta and the Flinders Rangers with its deep hues jagged mountain profiles and brilliant wild flowers, and then west to the Nullabor Plain with the longest straight stretch of track in the world the IP's track leads to Kalgoorlie. Further west the landscape becomes more traditional and finally reaches the Indian Ocean and the city of Perth.

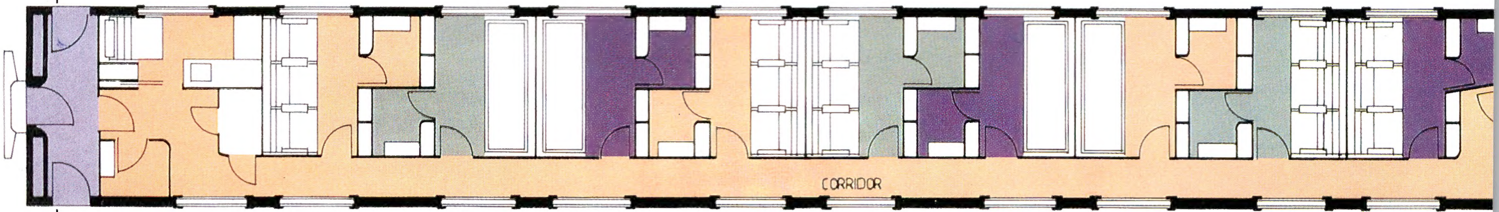
Now, it is planned to develop a more distinctive image for The Indian Pacific train service.

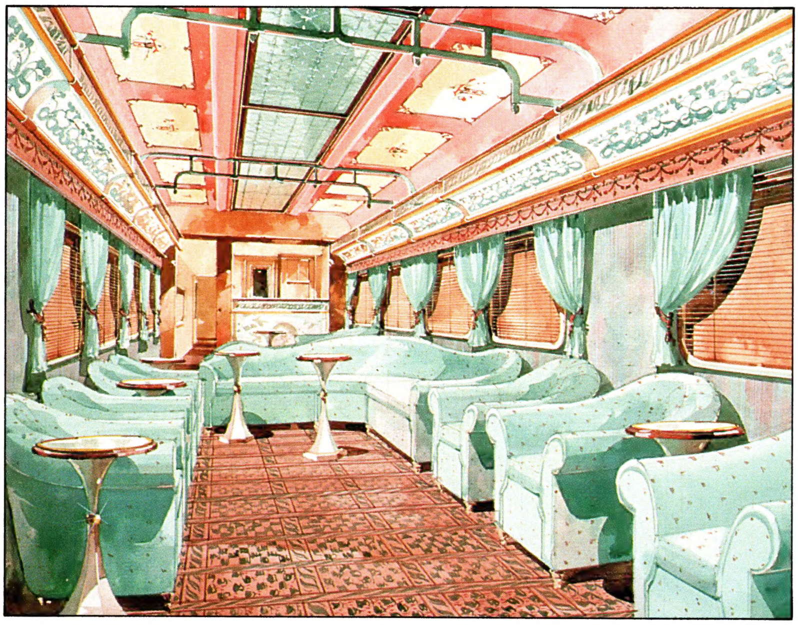
The interior design will provide all elements of accommodation that travellers expect in today's increasingly sophisticated tourist market.

Travellers on The Indian Pacific come from many parts of Australia and overseas. Selected images of Australia's landscape and history featured in the interior design will not only reinforce their views of the country but will allow history and special characteristics of the area to be used in promotion of the service.

That is the strategy plan.

Sleeping car layout





The Indian Pacific (far left) crossing the Farmer's Creek Bridge on the outskirts of Lithgow, NSW. The Silver City lounge (left) is named after the historic mining town of Broken Hill.

The Wedge Tail Eagle

In the search for a powerful graphic symbol for The Indian Pacific, a range of themes was explored, from well-known animals and flora, to reptiles and cockatoos. Only one symbol conveyed the strength of character to represent Australia's most epic train journey: *The Wedge Tail Eagle.*

The largest eagle on earth, the Wedge Tail conveys a sense of power, momentum and purpose as well as the freedom and adventure of Australia's greatest rail journey. The logo, as designed, shows the eagle in a perfect soaring stance. It helps to suggest the idea that The Indian Pacific covers "the greatest span of adventure on earth".

An intensive program to develop the graphics ontrain to reinforce the IP's appeal to travellers has commenced already. Items where graphics are being employed include livery exterior, livery interior, crockery, glassware, cutlery, restaurant items, lounge car items, toiletry kits, information packs, linen, stationery and souvenirs.

The interior design program covers all carriages of the Indian Pacific fleet. Concepts generally involve themes consistent with the landscape and environment through which the Indian Pacific travels and those areas that have historic Australian associations.

Among the first cars to be detailed are: Silver City lounge, Hannan's Bar, Queen Adelaide restaurant, Matilda's Diner, First Class Sleeping cars, Blue Mountains lounge, Nullabor lounge and Flinders Ranges Lounge.

Contained within the redevelopment of the Indian Pacific train is a total relook at the passenger segments offering potential long-term sustainable revenue. Three discrete areas ontrain will be developed to match resources, styles and service offerings for passengers.

☐ *First Class* — Upgraded and improved restaurants and service levels, enhanced decor and better information provision will satisfy the expectations of the discriminating traveller.

☐ *Family Class* — A totally new segment of the train, directly aimed at the self drive, family market will broaden The Indian Pacific's appeal.

☐ *Coach Class* — A low-budget service offering room to move, low fares and improved food and beverage service, it will cater for the economy-minded passenger.

Centres of activity

Lounge cars are the centres of activity on passenger trains. It is here that passengers can enjoy a drink, swap travel tales with new friends and generally relax and enjoy the passing landscape as it unfolds.

It is planned to improve the quality of decor and comfort in the lounge cars on the IP and to exploit the unique elements associated with this famous journey.

The first Indian Pacific lounge carriage to be planned and detailed is the Silver City lounge.

Named after the historic town of Broken Hill, the Silver City lounge will be themed to two of the major influences in the development of Broken Hill-mining and the Trade Union movement.

One of these is the Silver Tree.

On 5 September, 1883 Charles Rasp, a boundary rider on Mount Gipps Station pegged a lease on "the broken hill". By the early 1900's Rasp had become a very wealthy man and he commissioned an Adelaide silversmith Mr H.

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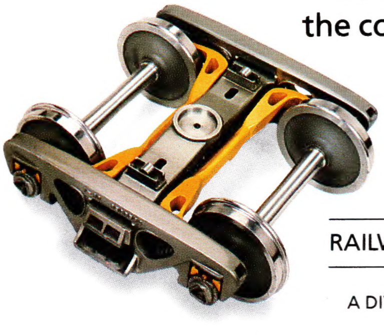

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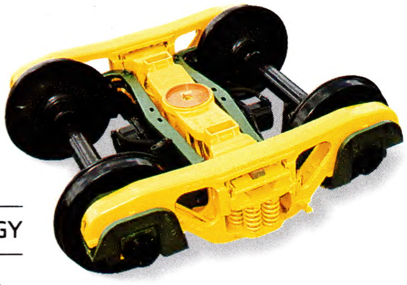

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Steiner, to make an exquisite Silver Tree. The silver for the tree was mined from Rasp's Broken Hill proprietary Company Mine. The tree which is a centrepiece, represents in intricate detail, typical Mount Gipps Station country.

Mining heritage is the second theme topic.

In the early 1900's life was short for the miner working in the arid, dusty, hot, outback town of Broken Hill. The harsh industrial environment of the mines took its toll and dependent families were often forced to watch the invalid miner die from "miner's complaint" "dusted lungs" and "the lead". Against this background of poverty, the longest strike in the harshest conditions in Australian history led to the emergence of the Barrier Industrial Council.

For the first time in Australian history, Trade Unionism at its most powerful developed and focused on the welfare of the workers living in a remote town.

In 1905 The Trades Hall was opened in Broken Hill. The building funded by and built for the miners housed main offices and became the meeting place of the powerful Barrier Industrial Council.

Hannan's Bar derives its name from history too.

In June 1893 Paddy Hannan was the first to discover gold at Kalgoorlie. At that time the district was known as "Hannon's Find" or just "Hannan's". Wealth won from gold was often celebrated by commissioning a personal ornament, sometimes made from gold taken from the miner's claim.

Hannan's, the piano bar on the Indian Pacific, will be themed to the early mining history of Kalgoorlie. The carriage name "Hannan's" relates both to the first miner to find gold and to the earliest name of the town.

The graphics in the carriage, for the car name plate, coasters and match booklets are derived from a unique miner's brooch currently on display in the Goldfields Museum. The interior of the carriage will be designed to reflect an atmosphere similar to the early Australian mining town pubs.

Other lounge cars in the strategy plan are:

☐ *The Blue Mountains lounge car*

The Blue Mountains are the first major geographical element encountered in the journey westward. The deep canyons and high plateaux are powerful elements in the landscape, and plant life varies from patches of rain forest on the basalt soils to dry eucalyptus vegetation elsewhere.

The intense blues, grey and violets have been chosen as the base colours for the Blue Mountains Lounge Car.

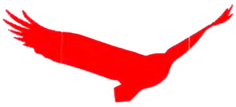
☐ *The Flinders Ranges lounge*

Since their discovery in 1802 by Matthew Flinders, who first saw the southern peaks from his ship in Spencer Gulf, the Flinders Ranges have provided a major tourist attraction for South Australia. The Ranges with spectacular wild flowers and jagged ridges of sandstone provide a wide palette to develop an interior theme. Australian made timbers, sandstone gravels and the wide colour range of local wild flowers will be utilised in this car.

☐ *The Nullarbor lounge*

As The Indian Pacific passes Port Augusta, it turns west, heading for the vast featureless plateau of the Nullarbor Plain. The word Nullarbor is compounded from Latin and means "no trees". Sand dunes and limestone cliffs dominate the coastline and the flat surface of the plains which cover more than 270,000 square kilometres.

WALUWARA



The Wedge-Tailed Eagle

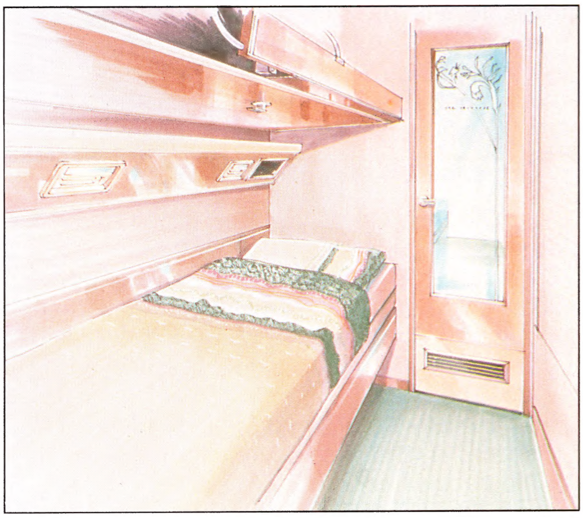
The Indian Pacific crosses the traditional tribal lands of the Pitjantjatjara, today one of Australia's largest and culturally strongest Aboriginal camps.

A Pitjantjatjara legend says that during the time of the creation — the Dreamtime — when the Spirit Ancestors formed the Australian landscape, the all-powerful wedge-tailed eagle, Waluwara, lived at Nanatunga Springs in the northern Musgrave Ranges of north west South Australia.

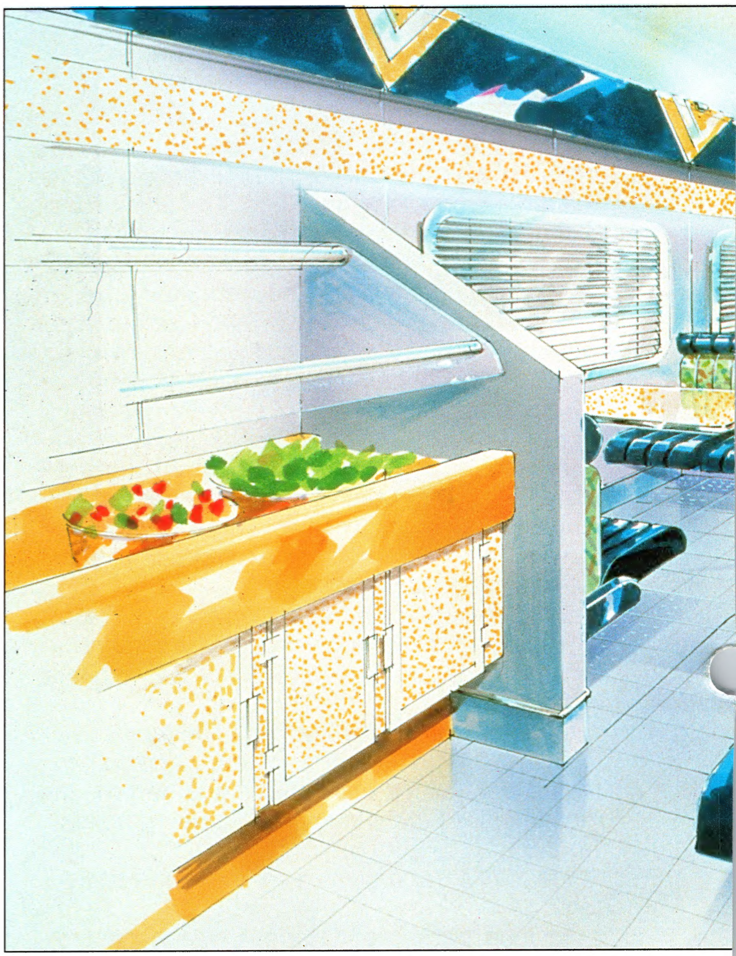
Waluwara shared his camp with his wife, a pink cockatoo, Tukalili, and with a crow-man, Kanga, and his wife, crow-woman.

One day when Waluwara returned from a long hunting journey, a fight broke out in which Tukalili and crow-woman were killed. In revenge, the crow-man, Kanga, killed Waluwara by a single blow with his boomerang.

Stories handed down through the generations say that the Waluwara dreaming extends as far south as the Great Australian Bight, crosses the tracks of the Indian Pacific on the Nullarbor, and stretches north to Unkatja.



Sleeping compartment (above) reflects the colours of the Australian Outback. Matilda's Diner (centre) will seat 32 people, and as well as family meals, will offer a 24-hour snack service. The Indian Pacific (far right) sweeps around a curve in the westward track.



FAMILY CLASS IS A NEW CONCEPT FOR THE INDIAN PACIFIC. IT OPENS UP A WIDER MARKET.

FAMILIES USUALLY ARE ON TIGHT BUDGETS AND NEED AN UNSTRUCTURED ENVIRONMENT.

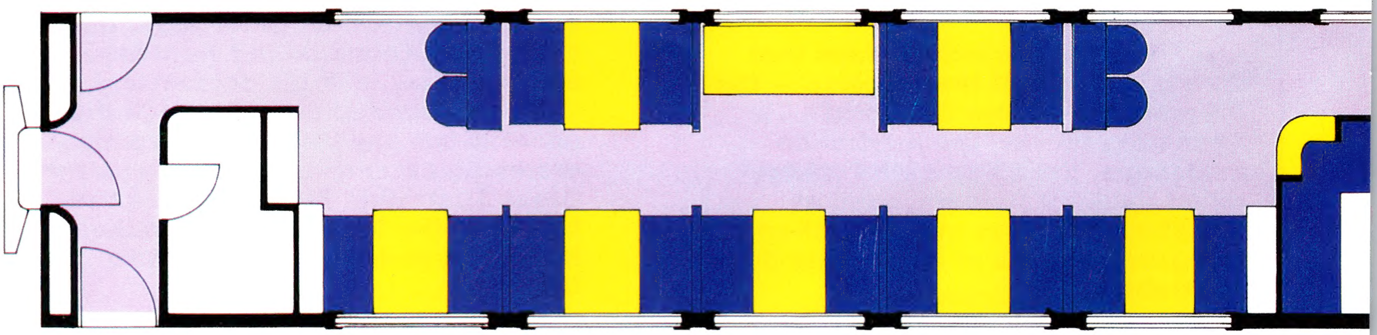
The upholstery fabric captures the colours of the landscape but also introduces views seen from the train as the sun sets. The patterns on the fabric can be related to the stony plains and also has an indication of Aboriginal dot paintings. Associated fabrics complete the palette of hues found in this area.

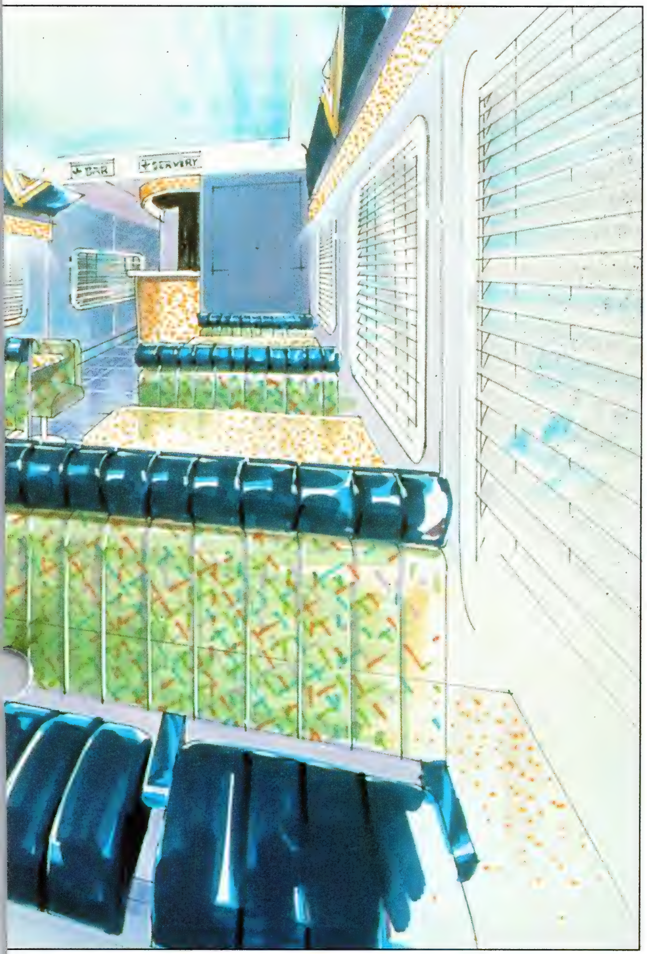
The dining experience

The refurbishment objective of dining cars on The Indian Pacific is to provide a first class dining experience.

First Class passenger numbers will be restricted to 88. Two sittings only instead of the current three will allow restaurant patrons to enjoy a relaxing and enjoyable meal. Time

Family Class carriage plan view





constraints in the past have forced the pace of dining which was not appreciated by many of the passengers.

The intensive service quality training program underway for all ontrain staff aims to ensure that customer service standards are upgraded and maintained.

Interior design themes will reflect Australia's historic past and be presented in a quality setting, which will serve to highlight the ambience of a first class restaurant.

The first dining car planned for The Indian Pacific is the Queen Adelaide restaurant. The interior theme will be designed around memorabilia relevant to the young Queen after whom the city was named. Menu cards will feature a Queen Adelaide graphic and a copy of the text of a letter which was written by Lieutenant General Sir Herbert Taylor to the first Governor of South Australia, Sir John Hindmarsh.

The colours in the carriage will be themed to a portrait of the Queen that was presented to the city in 1953 by a former Governor of South Australia, Sir Willoughby Norrie.

The carpet motif will be derived from a shawl that was man-made and presented to the Queen by the women of Saxe Meiningen, her birthplace in Germany.

The ambience of the dining car will be stylish and elegant. the materials and finishes, linen, crockery, cutlery and glassware serviceable and reflecting the theme of the carriage.

The Queen Adelaide motif will be used extensively throughout the restaurant featuring strongly on table dividers, pelmets and graphics.

Table presentation will be enhanced by the use of stylish yet practical crockery, cutlery and glassware. A classic look has been selected which will retain its relevance over time and will complement other dining car themes on The Indian Pacific.

Improved menu design will include stories and themes relating the history of Adelaide and its Queen which will enhance the tableware range and table setting.

There are few pleasures more agreeable than the combination of good dining and the romance of train travel. The elegant settings of the Queen Adelaide restaurant will present a striking contrast to the rugged settings that lie just outside the traveller's picture window. The traveller's journey across the continent of Australia will also be a journey across a range of delectable culinary delights.

In fact, the Queen Adelaide restaurant on the Indian Pacific aims to have everything to appeal to the lover of good food. As well as a menu to suit every taste, the restaurant will offer selected Australian wines and other beverages. Meal times on this, the most famous of all Australia's long distance trains, will be a special part of the holiday experience.

Sleeping with an ensuite

Sleeping carriages on The Indian Pacific will provide restful and relaxing havens ensuring privacy and comfort and incorporating ensuite facilities.

It is planned to develop two diverse yet compatible colour themes using firstly the floral emblems of each of the states of Australia through which The Indian Pacific travels and secondly, the concept theme of the Indian Pacific oceans which the train links.

These themes will be supported by a unique and engaging graphics program utilising visual elements of Aboriginal Dreaming in tasteful and quality linen items. In addition, information packages and amenity material will be presented to all first class travellers to provide more detailed information on the journey and the history of the train while at the same time providing some items of memorabilia.

The sleeper cars will be colour themed to a floral garland. The garland will be composed of wild flowers chosen from the Waratah of New South Wales, the Kangaroo Paw of Western Australia and South Australia's Sturt Desert Pea. Carpet and upholstering fabrics will complement the wildflower theme. A new approach to carpet mix is planned for the new carriages that will enhance and promote a more diverse and exciting colour presentation.

The Indian and Pacific Oceans are used as the second concept theme for the interiors of the sleeping car. The Australian continent is surrounded by water and the coastline is as diverse as it is long. There is a great variation in the nature of the shore, the depth and purity of the water and the forces that move it. All these things combine with the play of wind on the water and changes of light to offer a multitude of images.

The palette of colours for the sleeper car is soft and restful, which is appropriate for comfortable and relaxed travel. The upholstery fabric has captured the colours of the many patterns of the sea which will be a dominant feature with all other features relating to it.

The new Family Class

To build a substantial passenger business Australian National recognises the need to focus on the customer segments it wishes to contest within the transport sector and to look closely at needs and aspirations. Train travel has some basic differentiating qualities compared with other transport modes.

Part of the Indian Pacific strategy is to develop these attributes to better provide customer satisfaction and secure long-term support.

Family Class is a new concept developed to provide holiday solutions to the major self-drive family holiday market. Families generally are an informal group with children, operate on tight budgets and predominantly use their family car as the major holiday vehicle. This group needs an unstructured environment in which to relax.

Meal times need to be flexible, operating on wider time frames than currently exist. A self-selection system needs development to allow a measure of control on what to eat, when, and how much to spend. Food over the past 15 years in Australia has undergone major transformation in range, content and delivery. This changing pattern needs to be taken into consideration.

Special attention needs to be paid to children on board. Entertainment areas and a separation from parents should be allowed for. Design considerations in lounge carriage development must satisfy this family segment.

Fares in the past have been high for the economy sleeper section because of the inclusion of first class dining meal costs. Family Class will allow passengers in this section to decide for themselves how much to spend. Fares will automatically reduce with no meal component. This is a price sensitive group, but represents almost 80 per cent of domestic holidaymakers. Prices will need to be adjusted down to pick up volume, and Family Class fares will offer value for money.

Aiming at th

Matilda's restaurant takes its theme from the famous bush ballad *Waltzing Matilda*. Building on this theme, the restaurant provides a bright cheerful atmosphere yet retains the Australian bush feel with a highly-developed supporting graphics program.

Essentially it will provide for families with relaxing meal time opportunities incorporating freedom and informality. Much wider meal periods will be introduced to provide dining flexibility.

The 32-seat diner will provide maximum self service capability with a pre-prepared salad bar incorporating soup, bread rolls, etc., together with 24-hour self service tea and coffee facilities. Main meals including vegetarian selection can be ordered from the grill bar.

An essential element in family-based holidays is the motor car. Motorail services, therefore, provide a very strong opportunity to develop family ticket promotions. New Car Care carriers will improve accommodation for vehicles in transit.

Coach Class is growing

Coach Class is one segment of the train that has shown encouraging growth.

The improvements planned for the Family Class diner (Matilda's) will flow on to Coach Class. The installation of microwave ovens will provide the potential to greatly broaden the range and appeal of hot food.

The Indian Pacific refurbishment program will be extended to Coach Class including new upholstery and carpets. Improved maintenance practices will ensure a reliable level of equipment performance. This is very relevant to long distance journeys.

New customer service training programs will improve the capability and skills of attendants in

amily market

dealing with passenger problems on board. This improved training together with a revised alcohol policy will reduce any passenger behavioural problems.

Ready to compete

As is now apparent Australian National's strategic direction is to provide for the customer. A major proportion of the proposal for the refurbishment and product enhancement of the Indian Pacific has been developed with the rail passengers clearly in focus.

The decision has been made to complete for three customer groups.

☐ *First Class* — The over 50 years of age group, underpinned by international tourists. Fares will be high but will be acceptable within the total 'package' offer of a high quality, unique travel experience, providing excellent customer service.

☐ *Family Class* — The mass market made up of ordinary Australian families who mainly holiday with their children and travel in the family car.

Family Class travellers will be offered value for money fares that will suit budget travel. They will also be attracted by tactical price offers, utilising Motorail. This will become the fighting brand against air competition.

☐ *Coach Class* — The low budget transit traveller made up of 18-35 year olds, mainly singles and underpinned with international backpackers. Coach Class fares will reflect the direct competition faced by this commodity travel sector. The Indian Pacific will remain highly competitive in this area and pricing will reflect the higher value proposition of train travel i.e. room to move, facilities on board, and group interaction.

The Indian Pacific is truly a national train and a single operator such as Australian National will allow the service to tap into national markets — and huge revenue opportunities available — in a concerted and much more cost effective manner than at any time in the past, to present a truly national vision for holiday rail travel in Australia. The campaign devised for the relaunch of the new-look Indian Pacific, covers exciting and highly motivating new logo graphics, corporate advertising, retail advertising and both trade and consumer promotions. ☐

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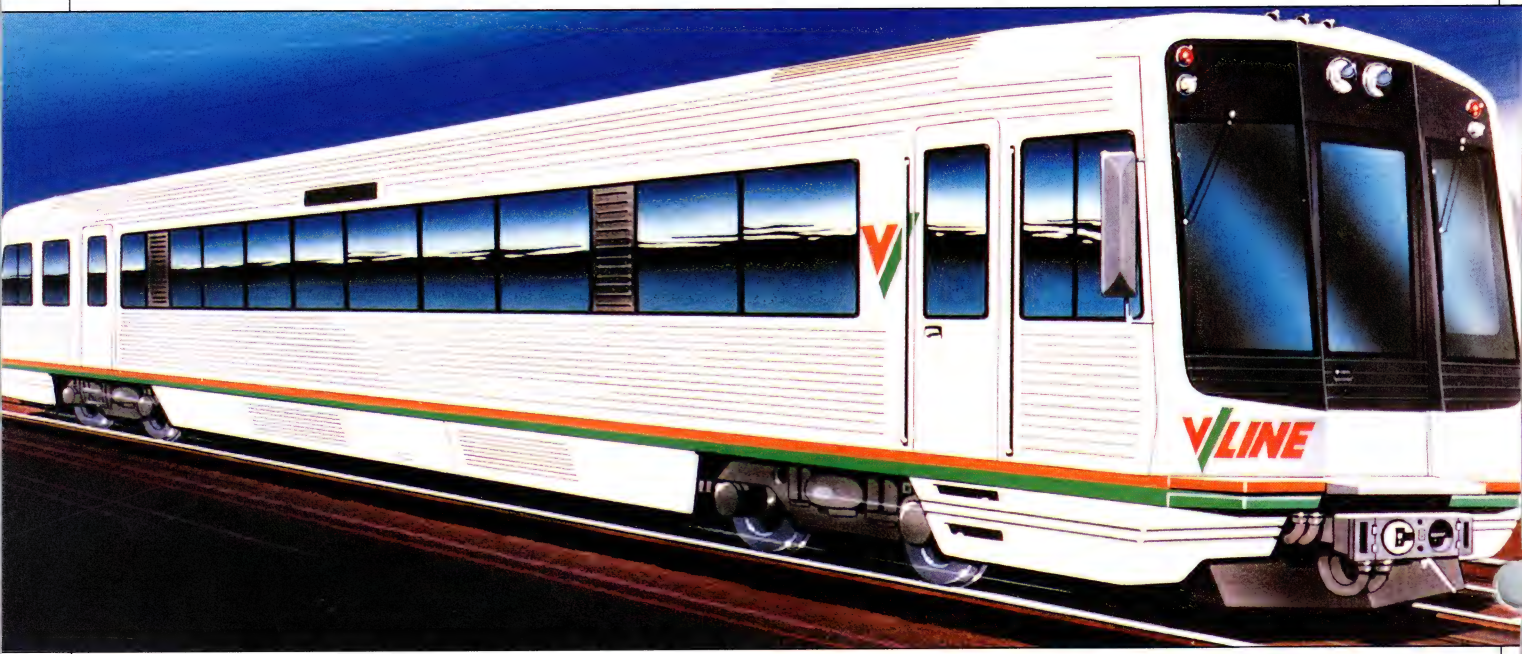


High speed with Sprinter

The 22 new Australian-designed and manufactured Sprinter trains scheduled to commence operation in Victoria by early 1993 will provide a faster service at more frequent intervals between Melbourne and major country centres.

Speeds up to 130 km/h will be possible with a smoother ride and greater passenger comfort. 81¼ mph

The Sprinters will run as a single vehicle or in multiple unit consists to the outer urban areas of Melton, Bacchus Marsh, Sunbury, Kyneton, Craigieburn/Donnybrook, Seymour, Leongatha and Stony Point as well as to the major regional centres of Ballarat, Bendigo and Geelong.

72 mph

The maximum rail speed in Victoria has been 115 km/h since the 1920s. The new services will effect significant reductions in travel times. The journey to Ballarat which takes one hour 50 minutes, will be reduced by 15 minutes and travel between Bendigo and Melbourne will take 15 minutes less, from two hours to one hour 45 minutes.

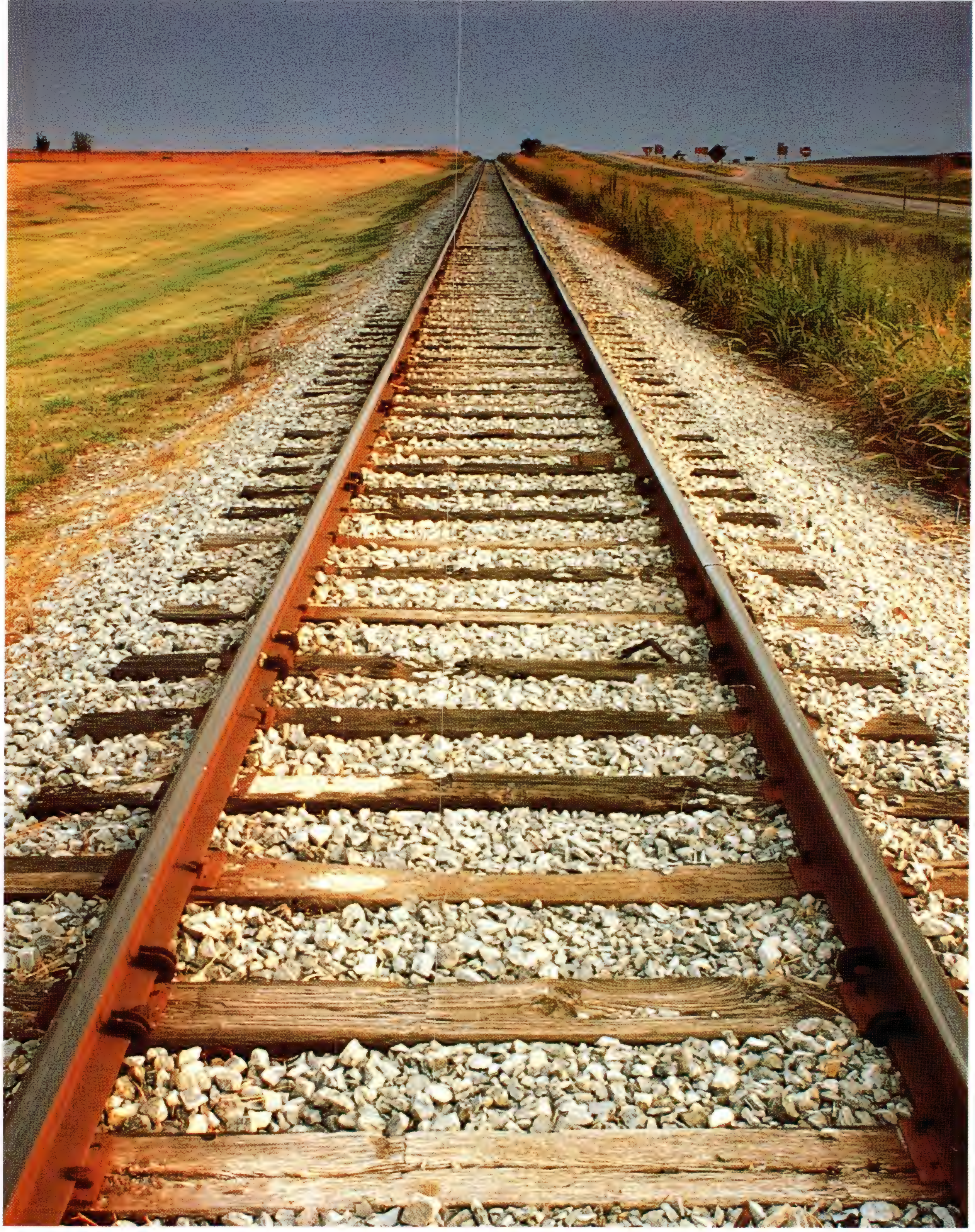
Sprinter services will be designed to reduce the social and economic isolation of residents in rapidly-expanding outer Melbourne areas.

At the same time as providing reduced journey times the Sprinter will consume around 40 per cent less fuel per passenger than a conventional locomotive hauled train and up to four times less than a motor vehicle. -(4x)

The new train will provide a quiet and comfortable ride in air-conditioned comfort, with panoramic views from the passenger seats, in a lightweight, yet strong and corrosion resistant stainless steel body.

There will be access for disabled people in wheelchairs. Fold-up seats provide space to allow disabled passengers to remain in their own wheelchairs throughout a journey and the washroom and toilet unit is designed to accommodate a standard wheelchair.

The Sprinter will have overhead luggage racks and separate luggage



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areas, one at each end of the train which can be locked by the conductor if necessary and which have provision for storage of bicycles.

$56 million cost

$2545,454.50 –

The 22 Sprinter trains for the Victorian Public Transport Corporation will cost $56 million. The Australian Government is providing $24 million of this under its Urban Public Transport Program and the balance will be met by the Victorian State Government.

Trains will be made by A. Goninan and Company Ltd of Newcastle, New South Wales, with substantial Victorian involvement including the Public Transport Corporation's own workshops.

Off peak frequency of service will improve as follows

Interior features of Sprinter include: air-conditioning; power operated entrance doors; large, double-glazed, tinted windows, closely spaced for panoramic views to the outside; floor-to-ceiling carpeting; generous luggage space, including overhead luggage racks; spacious washroom equipped with modern retention type toilet system; facilities for disabled passengers; and a public address system.

The train will have ergonomically designed, fixed type seating to make the most efficient use of the interior space and to provide comfort. There is a mixture of club style seating (face-to-face) and private style seating (face-to-back) so that passengers have a choice to suit their individual preferences. Wool cloth fabric, colour-keyed to the interior decor, will cover all seats.

SERVICE	FREQUENCY OF SERVICE	
	EXISTING	WITH SPRINTER
BALLARAT	every 3¾ hrs	every 1½
BENDIGO	every 4 hrs	every 2 hrs
SUNBURY	every 2 - 2½ hrs	every 1 hr
MELTON/ BACCHUS MARSH	every 1½ - 2 hrs	every 1 hr

The first Sprinter is scheduled for delivery by early next year and the second, one month later. A six-month break in delivery is then proposed before the third train is delivered. Delivery will then follow at the rate of one a month. The first two vehicles will initially be used for training crews and test running.

It is expected that by April 1933 the trains will be ready to enter revenue service. It is proposed that the first Sprinter be used on the Melton-Bacchus Marsh-Ballarat line and the second on the Sunbury-Kyneton-Bendigo line. When all Sprinters have been delivered, it has been estimated that the number of passengers who will use the Sprinter services will be 30,000 per week (or 1.56 million passenger journeys per year).

Below floor level, twin air-cooled diesel engines and high efficiency transmissions and auxiliary supply systems are used, providing higher performance and superior reliability than the existing trains.

The air-conditioning system uses R22 refrigerant, which is the least environmentally harmful of the commercially available refrigerants.

☐ *Air-cooled engines*

Air-cooled engines will be used for traction power, the first time such an arrangement has been used in an Australian rail passenger vehicle. Compared with water cooling, the air-cooled engines offer benefits of lower mass, higher reliability and the elimination of water treatment chemicals that require special handling and disposal.

☐ *Hydrodynamic transmission*

The Sprinter will use hydrodynamic transmission which is widely regarded as the best transmission for this type of vehicle. It offers superior efficiency to electric transmission at the higher speeds at which the Sprinter will operate and superior reliability to mechanical transmissions.

☐ *Electronic auxiliary power supply*

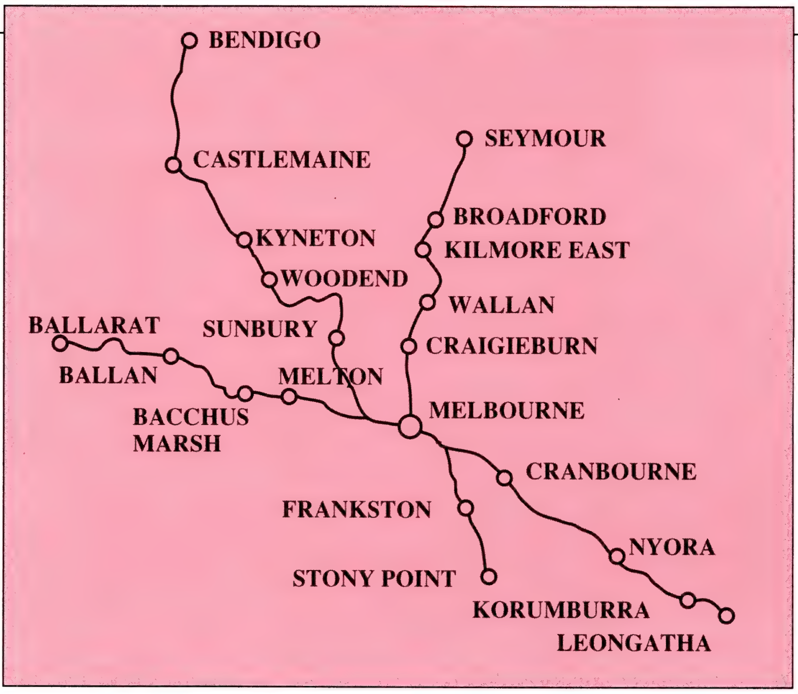
An electronic inverter-rectifier system will be used to provide auxiliary power (for air-conditioning, lighting and battery charging) from an alternator directly driven by the traction engines. It replaces the usual diesel-alternator set or hydrostatically driven alternators and is the first application of this technology in Australia.

☐ *Duplication of traction and auxiliary power supplies*

The new train will use duplicated traction and auxiliary power systems so that a problem with one small component will not cause lengthy delays. Many existing self-propelled passenger vehicles use the same number of engines as Sprinter (two), and in some cases more, but do not provide duplicated systems on the same vehicle. The benefits of more than one engine or

Technical features

Length	**25 m**
Mass (tare)	**46 t**
Maximum Speed	**130 km/h**
Traction Power per mass	**8.7 kW/t (max)**
Body	**Stainless steel monocoque construction.**
Engines	**Two air-cooled diesel engines, each of 12.8 litres capacity and 222 kW power output.**
Power Transmission system	**Two hydrodynamic two-stage transmissions with cardan shaft drive to axle drive units on two axles.**
Auxiliary Power System	**Two electronic alternator-rectifier-inverter units, providing 240/415 volts AC power.**
Control System	**Batteries supplying 24 volts DC, charged by auxiliary power system.**
Braking	**Compressed air actuated, anti-skid disc braking on all wheels with electro-pneumatic control and pneumatic back-up.**
Bogies	**High-speed, low maintenance type with air suspension.**



Victoria's new Sprinter fast train services will link major country cities and intermediate towns with Melbourne. The graphs (below) show its cost-efficiency advantages.

system, therefore, are not used to advantage in those designs.

☐ *High-performance braking system*

A high-performance braking system is fitted to enable the Sprinter to operate at higher speeds than locomotive-hauled trains in both the suburban and country areas. Two brake discs are mounted on each axle, with anti-skid equipment fitted to achieve required stopping distances without wheel damage which usually results when wheels skid.

Compressed air for the braking system and other features (such as power doors, toilet flushing etc.) is provided by a compressor integral with each diesel engine; this also provides the benefits of duplication. These compressors are inexpensive and require little maintenance. Vibration is not transmitted through to the passenger compartment because the compressors are part of each engine installation.

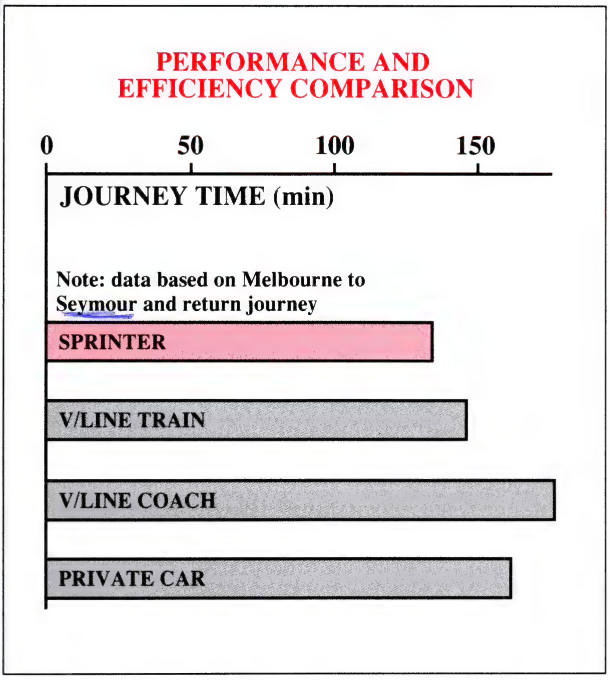
☐ *Multi-function couplers*

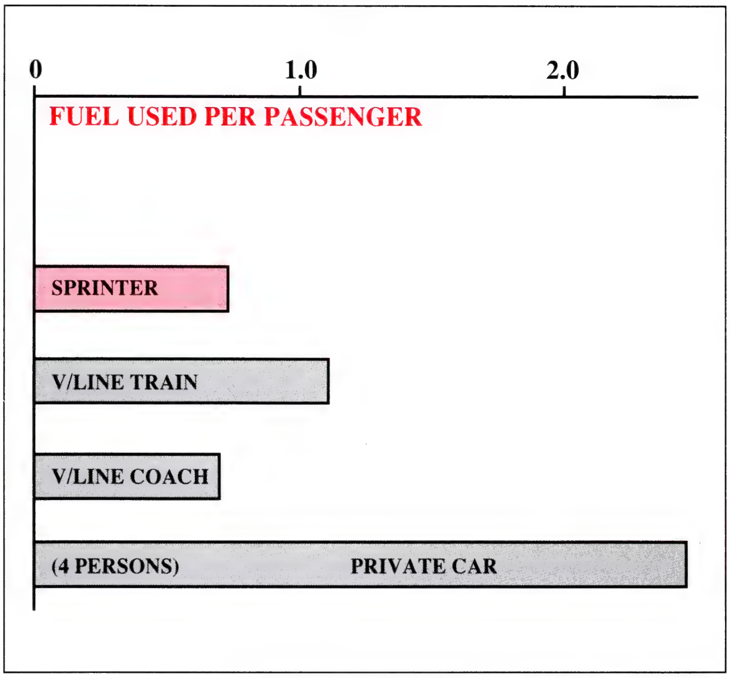
Multi-function couplers, which automatically connect adjacent vehicles mechanically, electrically and pneumatically, will allow the Sprinter to be coupled and uncoupled rapidly, by the driver alone.

☐ *Ease of maintenance*

Underframe mounted equipment on the train is fitted in easily-removable modules to facilitate easier and faster maintenance.

The Victorian Public Transport Corporation says the Sprinter arguably will be the most energy efficient means of moving people, quickly, throughout country Victoria. Features contributing to the train's efficiency include: a low total vehicle mass and a very low mass per seat (Sprinter 480-530 kg/seat/ existing V/Line trains 970-1210 kg/seat); its ability to operate as single vehicles or in multiples to best meet passenger demand; use of hydrodynamic transmissions and electronic auxiliary power supply systems to give highest overall efficiency of power conversion; high utilisation of internal space; and, use of momentum, wherever possible, instead of diesel fuel to provide auxiliary power generation. ☐





NRC opts fo

The newly-formed National Rail Corporation (NRC) will have its Australian headquarters in Sydney. Mr Vince Graham, chief operating officer of the State Rail Authority of New South Wales, has been appointed chief executive officer of the NRC.

He will take up his appointment early this year following his return from a holiday overseas.

Mr Graham formerly was manager of the NSW Grain Handling Authority, and for several years prior to that was responsible for developing, marketing and managing the operations of the NSW State Rail intra and interstate freight services.

Announcing the appointment, the NRC chairman, Mr Ted Butcher, said: "Vince Graham has a wealth of expertise to offer the new Corporation and to lead it through its early establishment period.

Mr. Vince Graham,
NRC's Chief Executive Officer.

CityRail gearing for automatic fare collection by June

The first major milestone in CityRail's automatic fare collection (AFC) project was reached recently when the central computer was installed at Transport House, Sydney.

The $1.2 million central computer will be the central control system for the new $60 million automatic fare collection project.

It will monitor ticket issuing machines and barriers, and produce management information by collecting data associated with revenue, passengers flow, security, system management and machine availability.

AFC project manager Phil Terry took delivery of the new computer from representatives of major contractor Smorgon Cubic Pty Limited and sub-contractor Digital Equipment Corporation (DEC).

Automatic fare collection will be progressively introduced from June this year at CityRail stations.

The first machines are being delivered to Petersham Training College in January 1992 for integration testing and staff training. Station installations will begin in June at outer metropolitan stations and progress to suburban and city stations.

The size and type of AFC machines will be adapted to the needs of the stations.

Staff have been trained on the DEC system and will work with the AFC contractor to install the program. The AFC project team has been working on converting the present manual ticketing procedures to a data entry form.

Sydney headquarters

"Now the chief executive officer has been appointed and the location of the headquarters has been decided, further senior appointments will be made as a matter of urgency.

"Because of the decentralised corporate structure which the Corporation will adopt we must stress there will be a relatively small number of staff of between 20 and 30 people based in Sydney at the corporate headquarters," Mr Butcher said.

The reason for selecting Sydney for NRC headquarters was based largely on the projections for future business.

Mr Butcher said that in line with the Corporation's objectives to work closely with its customers, it would provide a unique 'one-spot' customer service and information centre.

"The information technology required to establish and operate the centre will be undertaken by a consortium headed by BHP Information Technology with the Victorian Public Transport Corporation and ADL Consulting Pty Ltd as sub-contractors," he added. The NRC planned to have the centre operating by February this year.

Incorporated in September 1991, the NRC is a commercial operating company responsible to its four shareholders – the Commonwealth, New South Wales, Victorian and Western Australian Governments. While Queensland and South Australia are not participants in the financial equity of the NRC at this stage both governments fully support the new Corporation.

The NRC will operate under the provisions of the Companies Code as a strictly commercial organisation at arms-length from government.

It will control, for the first time in Australia's history, all interstate rail freight marketing and service delivery throughout the nation from early this year. Benefits to customers will be significant as they will be dealing with only one organisation, and not with up to five separate State authorities.

The nine Board members of the National Corporation are: Messrs Ted Butcher (chairman); Vince Graham (chief executive officer); Gavin Keneally (former SA Transport Minister); Laurie Carmichael (former assistant secretary ACTU); Max Moore-Wilton (NSW director-general of transport); Michael Wright (Victorian deputy director-general of transport); James Strong (national chairman of partners Corrs, Chambers, Westgarth); Stuart Morgan (managing director Westintech Ltd); and, Peter Young (joint managing director, Burdett, Buckeridge & Young Limited).

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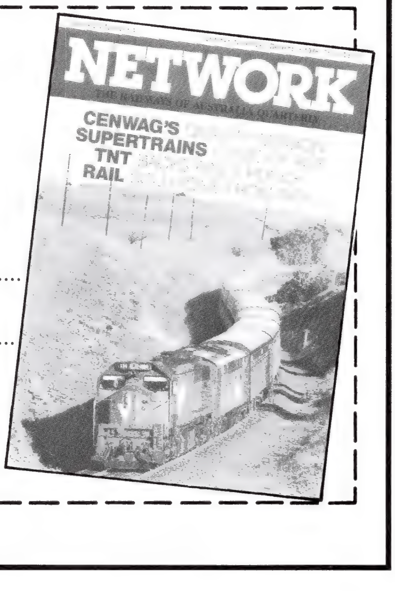

TRACKS

NRC's northern base is Acacia Ridge

SUPERFREIGHTERS FROM THE SOUTH ARE LOADING AND UNLOADING DAY AND NIGHT AT ACACIA RIDGE. THE THIRTY-THREE TONNE GANTRY CRANE (TOP RIGHT) IS TRANSFERRING A CONTAINER TO ROAD TRANSPORT AT THE TERMINAL'S SOUTHERN PAD. OPERATIONS (BELOW) CONTINUE INTO THE NIGHT.

The National Rail Corporation's operations in north eastern Australia will centre on the Acacia Ridge freight terminal in Queensland at a time when freight forwarders are expecting a rapid growth in interstate rail traffic into Brisbane.

A heavy capital investment in modern equipment and terminal expansion at Acacia Ridge has occurred already as part of Queensland Rail's development plan. Further upgrading will be necessary, however, to bring the freight handling terminal up to world class.

Acacia Ridge will be the northern link with huge freight terminals in Sydney, Melbourne and Adelaide. The South Dynon terminal in Melbourne already has been earmarked for massive expansion and upgrading.

Located 14 kilometres south of Brisbane and 100 kilometres north of the NSW border, the 44-hectare site is the centre of Queensland's interstate rail freight activities.

The terminal's 13,288 m of track (46% standard gauge, 26% Queensland gauge and 28% dual gauge) and two container pads can accommodate 600 bogie-type interstate wagons and 300 Queensland gauge wagons.

Major operations involve the transhipping and marshalling of trains bound for the southern states (70% of traffic) and Queensland destinations (30% of traffic) and the servicing of the 16 private sidings which surround the terminal.

In recent years, the major growth in traffic has been in Superfreighter services from the southern states. The Sydney (five services per week) and Melbourne (six services per week) Superfreighters utilise the terminal's resources for the major part of each day, with the remainder of the facility's continual seven-day operation devoted to container consists, freight forwarders' traffic, steel trains and the newly-opened small freight terminal.

Until recently, the Sydney Superfreighter was serviced on the 473 m southern container pad using a 33-tonne gantry crane and two forklifts of 21.5 tonne and 24.5 tonne capacities.

The Melbourne train was divided, with one portion being shunted to the northern pad and unloaded by a 40-tonne crane.

The need to accommodate increased traffic has resulted in a 331 m extension to the southern pad and the purchase of two 36-tonne forklifts. When normal conditions prevail, both Superfreighters are now serviced on this pad.

The northern pad is currently utilised for intrastate container traffic, and the transhipping of steel rails bound for either the workshops or various northern destinations. Containers are serviced by the 40-tonne crane while the rails are loaded and unloaded with a special magnetic crane.

The acquisition of the two additional forklifts has considerably increased the freight handling capacity of the terminal. The fact that these machines can handle transiflat and 12.2 m containers has enabled full utilisation of the southern pad extension.

Escalating demand will see the Melbourne Superfreighter service increase to nine trains per week. Backloading on these trains will also be relatively heavy, with current services being consistently booked out.

Despite this, the Queensland Rail presence at Acacia Ridge will not disappear. The terminal will be the southern centre of Queensland Rail's rapidly-growing intrastate container operations.

Innovative services, such as the northern Superfreighter and QRPAK (i.e. door-to-door containerised freight delivery) are currently taking advantage of this growth with a great deal of success. However, opportunities do exist for further expansion and greater profitability, and Acacia Ridge will play a major role in the achievement of these goals. ☐

How CHICS containe

The predicted container traffic growth through one of Australia's largest container terminals, South Dynon Melbourne, is 10 per cent per annum during the next 15 years. A major redevelopment of the terminal has been initiated to increase the ultimate handling capacity to in excess of 725,000 containers per year.

The terminal is now operating close to its current capacity of 220,000 containers a year.

As part of a staged development plan and in order to provide an efficient and competitive service, the Victorian Public Transport Corporation is installing mainframe computerised Container Handling and Inventory Control System (CHICS), which is due to become operational in January 1992.

Some of the major functions of CHICS are:

☐ *Customer bookings.* The facility to book a container onto a train.

☐ *Container tracking.* The facility to continuously track in "real time" all container movements within the terminal and enroute from or to a destination.

☐ *Yard management.* The system provides full control of the available storage areas by directing containers to designated areas to meet terminal requirements.

☐ *Yard planning.* The exact location of every container in the terminal can be accessed from the computer.

☐ *Task control.* Radio data links for individual equipment operators and pagers for truck drivers provide "next task" displays which will ensure optimum use of all equipment.

☐ *Management reports and performance statistics.* A comprehensive reporting function will enable operators and management to have readily accessible information concerning the operation of the terminal.

How the system works

The objective of the system is the effective and efficient control of the terminal. It works this way:

All containers will be booked for the nominated trains and receive a booking number. On arrival at the in-gate the driver presents the required paper work with the booking number. All relevant data will be entered into CHICS and the driver will receive a BAT/pager for identification and instructions for real time control while in the terminal.

CHICS will then sort the container into the appropriate job queue. It will call the truck forward, to the location where the container will be loaded or unloaded, by displaying a message to the driver on the BAT/pager.

The container handling machines and the supporting ground staff will be equipped with radio

controls handling

SO VERSATILE IS THE EQUIPMENT IT CAN TRACK CONTAINER MOVEMENT WITHIN THE TERMINAL AND EN ROUTE TO A DESTINATION. IN FACT, IT CAN DIRECT CONTAINERS TO LOADING AND UNLOADING POSITIONS.

data terminals which will provide the freight handling operator with instructions about the job to be performed.

The system handles many other situations such as: off-loading from truck to storage, loading from storage to train, tracking Superpak containers, and planning of door-to-door services.

The benefits the system will bring to South Dynon include:

☐ Efficient container booking system, and better use of container handling equipment and rail vehicles.
☐ Reduced cost of container handling, efficient use of container storage space, and reduced truck service time in container terminal.
☐ Enhanced management information and terminal control.
☐ Segregation and handling of dangerous goods.

CHICS will be an integral part of the operational and business needs of the PTC. It has a real time terminal control system which will meet both rail and terminal requirements as a total package.

Victoria has more than 4500 vehicles plus some 2000 intersystem wagons in the State at any given time.

Wagon Monitoring Process

The movement of each of these wagons is controlled and monitored by another computer system called OCS/ROSCO (Operations Co-ordination System/Rolling Stock Control). The system can provide answers to the following questions:

☐ Is the wagon at a location, on a train or in for repairs?
☐ Is the wagon empty or loaded?
☐ What is the repair condition of the vehicle?
☐ What were the wagon's last eight moves?
☐ Is the wagon carrying dangerous goods and, if so, what are the dangerous goods and what are the handling procedures?
☐ If the wagon is on a train: what time is the train due at a location, what is the schedule of the train, is it running on time, and if not why is it running late?

The system will also indicate if the train is scheduled to attach/detach enroute, if there are any containers on the wagon and what is the consist of the train.

Wagon monitoring is not the only function the system performs — it can do much more than that. It can provide train schedules up to nine months in advance, and the proposed train running program for any location (for train crew, loco and staff rostering) or general enquiries.

It can display and print the consist of a train before departure and enroute, list all vehicles at a location with their current status and condition, identify all repair wagons at a location, locate and provide container information, and identify customer orders and the planned movement of the vehicles to satisfy the order.

The system is "real time", which means information is entered as events occur.

OCS/ROSCO gives clients confidence that their product will get to its destination on time and intact. PTC staff are confident too — they know at any time where the product is, and what wagon it is on.

The OCS/ROSCO concept is that the allocation and movement of all rolling stock is driven by client or internal orders. The system basically works in this way:

Upon receipt of the client order, the movement plans are inserted into the computer to satisfy the order. The sytem then ensures that the closest available empty wagon/s are sent by the nominated train/s to the load point. These plans are created to ensure that the wagon reaches the client's load and end destinations on schedule.

As the required empty or loaded wagons are marshalled onto the nominated train, the relevant wagon details are entered into the computer, and after train makeup is completed and confirmed, a "train consist package" is produce and given to the driver.

The load profile provides the driver with the weight distribution of the train, and helps him in his decision-making on braking and powering techniques, an important factor in economical fuel performance.

From receipt of the client order, through to vehicle allocation, loading and train despatch to the end destination, all users (and indirectly therefore, clients) have current status information on vehicles and consignments. ☐

Container lifting

Door-to-door container pick-up and delivery services operating in conjunction with Queensland Railways highly successful Superfreighter services are improving the productivity of manufacturers and distributors of an extensive range of products.

QR Pak, as it is called, is designed to integrate road and rail transport by contracting local carriers to both pick-up and deliver containers in Brisbane, regional ports and centres serviced by QR container lifting equipment.

With the speed and efficiency of electric locomotives, and the security of containerisation, the QR Pak/Superfreighter combination is a major force in interstate freight.

Now, Queensland Rail has introduced a new Superfreighter service to North Queensland. Linking with Superfreighters from the southern States of Australia it departs Brisbane each week day for Rockhampton, Townsville and Cairns.

The Superfreighter is a dedicated container train concept and is designed to improve efficiency in container haulage and provide better service to the rapidly-expanding northern markets.

Timetables co-ordinate with the arrival of the New South Wales Superfreighter at Acacia Ridge, the main QR freight terminal at Brisbane.

The Superfreighter service to the north departs from Clapham weekdays at 7 p.m. providing overnight transits to Rockhampton at 9.15 a.m., Townsville 5.35 a.m. and Cairns 12 a.m. Land-based container parks at Murarrie, Mesco South EA Rocke and Doomben Zone 12 are recognised centres to service the project feeding Clapham with shunts to connect.

It is anticipated that the Superfreighter will be conveying 2.9 metre HiCube containers to Mackay by June 1992 and to Cairns by June 1993.

Container wagons at 100 km/h

More than 1,400 container wagons capable of travelling at speeds up to 100km/h ensure a quick, efficient year-round service in Queensland.

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TRACKS

Space-age technology helps PTC's driver training

World-class expertise is right here at home

Simulators at the Victorian Public Transport Corporations's Driver Training Centre, the most modern and best-equipped in Australia, will be able to precisely duplicate real train journeys as a result of a technological breakthrough of international significance involving the use of satellite navigation technology.

The system for recording track information for simulation has been developed in conjunction with University of Melbourne's Department of Surveying and Land Information, and Sagem Pty Ltd, Australian agents for the Astech equipment used in the project.

The need to record such information was identified when it was discovered that existing track survey information was inadequate for simulation purposes.

This meant that information displayed on the on-board computer screen in the simulator cabins at the Driver Training Centre was not synchronised with vision and the mathematic model at the heart of the operation. The track geography information available was based on, or

▶ CONTAINER LIFTING (from previous page)

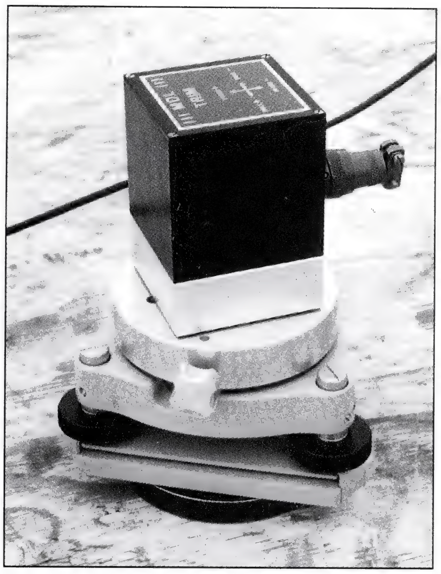
transported by QR include meat, cotton, grains and other agricultural products; minerals; industrial chemicals; ammonium nitrate.

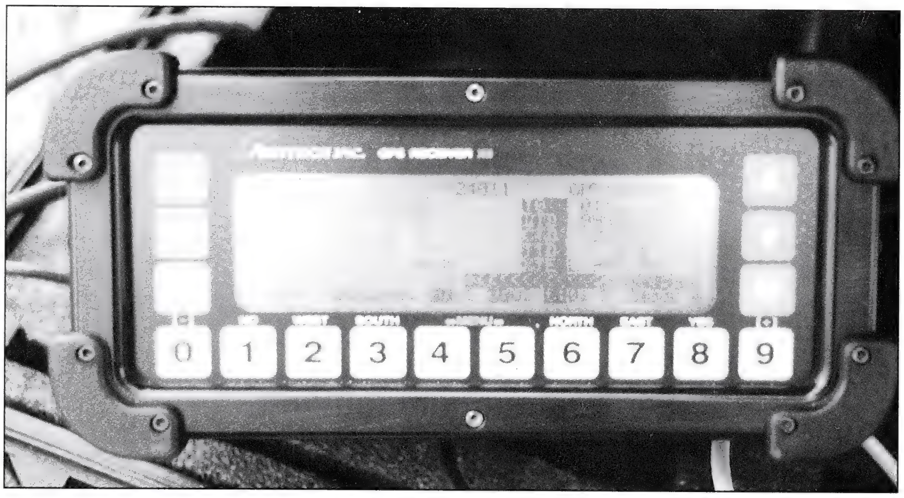
The QR Pak service offers, convenience and productivity of door-to-door delivery, and tight security (the customer locks the container on the premises, and it is not unlocked until it reaches its destination).

A comprehensive range of containers is available to suit the individual needs of customers. There is a capability to deliver privately-owned containers, and competitive and confidential freight rate structures can accommodate individual needs and volumes.

In addition, there is the option for customers to have containers painted as their own moving billboard advertisement.

The latest computerised booking and monitoring procedures complete an efficient service. ☐





The Trimcube (top left) mounted in the floor of the modified rail-mounted vehicle (right). The Ashtec receiver (above) showed success on its screen.

comprised, track survey documents some of which were more than 100 years old.

It was discovered that the original rail track surveys, although locally accurate, could not be fitted together to produce A to B data without considerable accumulated error. A number of factors contributed to this including the absence of transition curves and the fact that track was not necessarily laid precisely along the surveyed centre line.

The situation was exacerbated by the fact that topographical features had changed since the initial survey. Bridges had been built, crossings constructed, and so on. The end result was an accumulation of track variations which, when logged into the driver training simulator, produced significant errors causing the simulator train to behave in a manner inconsistent with the terrain.

Being able to reproduce actual train behaviour and to pinpoint train location in relation to the track terrain is crucial to driver training. Only in this way can the human-machine interface be accurately assessed, corrective action taken when necessary, and various situations and emergencies built into the simulator training sessions.

Driver training project officer, Michael Clark, says: "We looked in a number of directions to correct this situation. One of them involved the Global Positioning System (GPS) based on the American military Navstar satellite navigation system as successfully demonstrated during the Gulf War.

"The GPS is operated by the American armed forces, but is available for civilian use, and it occurred to me that by locating points on the railway track we might use the GPS as a reference.

"Initally we approached Sokkisha Pty Ltd, the Australian agents for Trimble navigation equipment. In conjunction with this company we fitted a couple of satellite receivers on a rail vehicle and ran it from Melbourne to Ballarat taking readings every 14 seconds.

"This exercise proved it would be possible to do what we had in mind; it was a feasibility study," Mr Clark said.

The project team found the GPS gave a very accurate fix. Each positional fix is a survey exercise in itself. In association with Sokkisha there were consultations then with the Royal Melbourne Institute of Technology (RMIT) as a result of which it seemed worthwhile to take the survey process to a more advanced stage.

A search of published literature then available revealed that Finland was looking at other ways of cartography and had decided to use GPS in a differential mode. After studying the Finnish exercise it was felt this was the way to proceed.

At this stage the University of Melbourne was approached to see if there were ways to enhance the GPS system. The Department of Surveying and Land Information through its deputy head, Mr Frank Leahy and lecturer Mark Judd, suggested integrating input from an inclinometer – an instrument which can measure speed, bearing and cant or tilt in two planes to within 0.03 of a degree.

In addition, they suggested – and developed – additional integration of velocity and bearing data from other sensors.

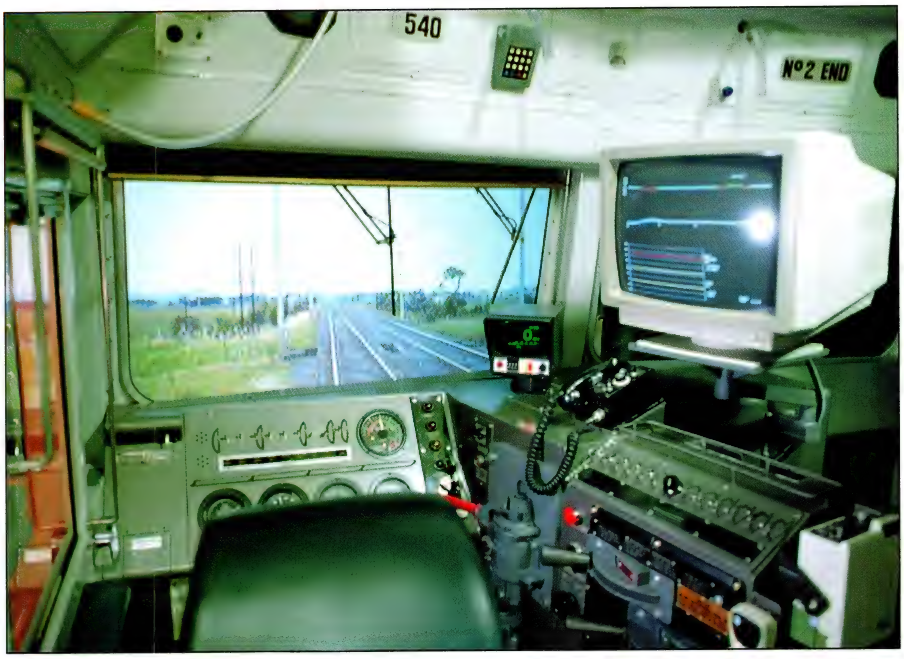
The driver training simulator cabin, one of several at the Victorian Public Transport Corporation's driver training centre, provides a real life experience for trainees.

The view from the cabin window, and the performance of the simulator locomotive under their control is now just the same as the real thing.

Team members responsible for the development of the sophisticated technology are (from left at the rear of the table) Alan Whitla (PTC development and implementation manager); Michael Clark (project officer driver training); Mark Judd (University of Melbourne); Rod MacLeod (project manager GPS from Sagem Australasia Pty Ltd).

In front of the table are (from left) Colin Arrowsmith (GIS consultant, Geodata Australia); Greg Hoinville (PTC senior surveyor); Colin Oates (PTC corporate training manager); Adam Anderson (project engineer driver training project.

Their success has attracted international interest.



PICTURES: PTC PHOTOGRAPHIC RESOURCES

Using the mobile satellite receiver on a PTC hi-rail vehicle to take readings now at one-second intervals along the track, and with the help of a static reference receiver positioned at a known location (geodetic trig point) and some sophisticated computer software, it was found possible to use differential post-processing to obtain a very accurate track profile.

So, with readings sampled every one second from the GPS and five times per second from the inclinometer along the track at 40 k/mh it became possible to obtain a three-dimensional profile of the track itself. This was then processed to 'smooth' the output data.

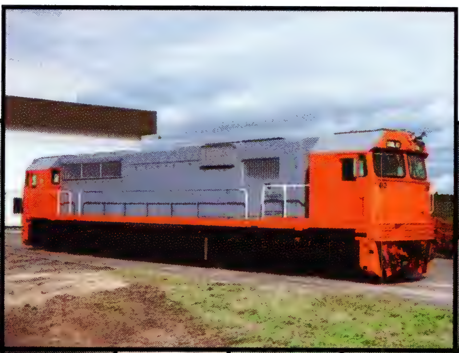
The system was trialled on Sunday 20 October last year between Sunshine and Bank Box Loop on the western corridor.

However, to transfer data collected to the driver simulator setup a custom-developed suite of integration software was required. The university was able to develop this and the story of its development is a significant achievement in itself.

To obtain the three-dimensional profile requires a minimum of four of the 24 Global Positioning Satellites at least 10 degrees above the horizon at the one time. They cost nothing to use. Readings are not affected by weather conditions. A trial run from Sunshine to Goroke proved that this was a very inexpensive way of successfully undertaking a very accurate track survey.

This new technology has now been transferred from the University of Melbourne to the Victorian Public Transport Corporation which sees it having wider uses in the future. Enquiries: Mr Michael Clark, PTC Driver Training Project Officer. Telephone (03) 619 2078. Fax (03) 619 4612. ☐

Clyde Motive Power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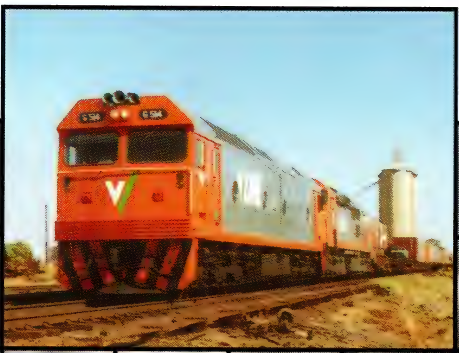
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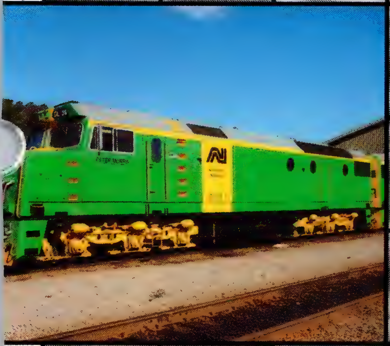
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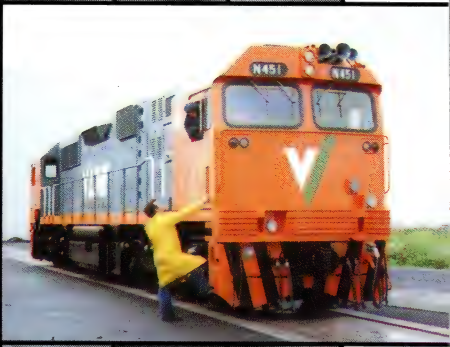
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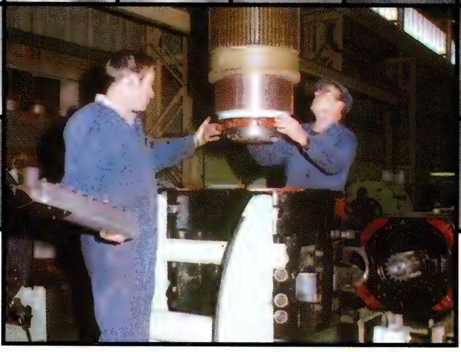
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The railway technologists with Australia's greatest heritage

Established in 1898 and keeping pace with today's needs of Australia's greatest railways, Clyde Motive Power offers the world's best.

1. Clyde were the first to introduce microprocessor controlled diesel electric locomotives. The Australian National 2240 kW "DL" class incorporates the General Motors 60 series technology into an Australian designed locomotive that is setting new standards of performance.

2. The same technology was used in the 2240 kW GML10 dual cab narrow body locomotive supplied to Goldsworthy Mining Limited. This locomotive entered service in May 1990 hauling trailing loads up to 9000 tonnes using super series wheel slip control.

3. V/Line's "G" Class 2240 kW locomotive also incorporates super series with the 16 cylinder 645E3C series turbo-charged engine; 33 are in service.

4. V/Line's high-speed requirements for passenger and freight service are provided by the 1680 kW "N" class locomotive of which 25 are in service. These incorporate the 12 cylinder 645 series turbo-charged engine and Dash 2 wheel slip control.

5. Manufacturing facilities at Clyde's Bathurst and Brisbane plants have supplied over 10,000 DC traction motors for locomotives and passenger vehicles in Australia and overseas.

6. Clyde manufactured traction motors for Queensland Rail suburban and interurban trains supplied by ABB-Walkers.

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Clyde 16/19

BEHIND THE GLASS

in train windows and doors

By PAUL THOMPSON
Manager, Composite Products, Beclawat Pty Ltd

As you look through the large windows of modern railway carriages at the ever-changing panorama of scenery on your way to work each morning do you ever think about the experience and technology which has made this type of glazing possible?

It is the one thing probably furthest from your thoughts. Yet it was not so many years ago when train windows often cracked and even shattered in their wooden frames with the continual stress of travelling over rail lines.

In the days of creaking wooden carriages windows were smaller and they could be opened for ventilation occasionally falling from their open retainer slot and slamming down into the wooden frame. Window replacements were a frequent requirement of carriage maintenance.

Today's glass is tougher, it is mounted and held in place more securely, and it can withstand the rigors of constant movement over rail with a much higher degree of tolerance. Larger windows have become a reality offering the rail traveller light, space and an enriched viewing experience of the passing scenery.

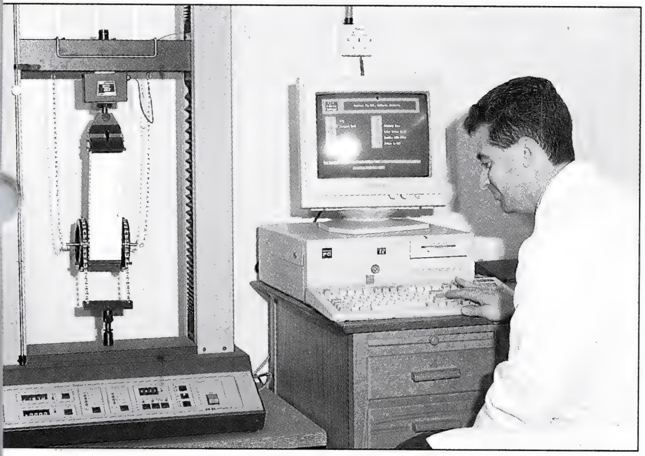
Consider the enormous pressure generated when two trains speed past each other in a tunnel. Glazing of windows and doors must withstand such pressure time and time again. There can be no room for error in the quality of the glass or in the way it is mounted into the door and window frame because passenger safety is of paramount importance.

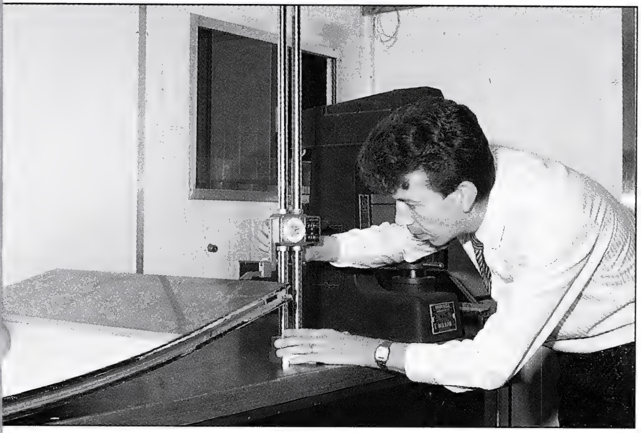
The engineers and designers at Beclawat Pty Ltd's factory in Dandenong, Victoria, have contributed significantly to the development of glazing for railway rolling stock during the past 30 years. Recently the company has increased its capitalisation in plant to facilitate production of world standard composite products primarily for doors and structural components for rail rolling stock.

The company is now poised to meet a commitment to the international marketing of its product and expertise in rolling stock componentry. Its fabricated and composite products have received acknowledgment as part of the award-winning Tuen Mun light rail system in Hong Kong.

Its designs are used extensively in all States' passenger rolling stock in Australia. Main window designs range from the new age techniques of the triple glazed Goninan/SRA Tangara with passenger protection and

The expanse of glass in Perth's new suburban trains is clearly seen. The other pictures show Beclawat designers at work testing window and door materials.





aesthetics utmost, to balanced half drops which provide superb ventilation in non air-conditioned vehicles such as Melbourne's T3000 LRV's.

Windscreen assemblies are designed with crew safety paramount and careful evaluation of impact testing is considered during research and development to ensure compliance.

Composite door leaves

Composite construction door leaves have been a first for Australian passenger rail with the Beclawat-designed product first supplied to Walkers/Westrail EMU's.

The Westrail contract took the company into the composite materials area with the rigorous specification requirements for a lightweight door structure that still had excellent aesthetics.

The door leaves, a first in Australian passenger stock far exceed specification requirements with rigidity up 80 per cent on a blank leaf weight of 17kg. Fire and smoke testing proved well below AS1530 at 0.0.0.0.–1 indices

The doors are meeting expectations of finish, matching the white saloon and brushed stainless exterior and using Viracon high performance side facing glass to FRA type 2.

The composite honeycomb structures produced by Beclawat involve a low density web core providing a continuous area of support for skin facings analogous with an 'I' bean. This uniform support allows thinner skins to be highly stressed, spreading any load cross the entire area of the component.

Even in these industrial composites, Beclawat selects aerospace grades in aluminium and honeycomb core and pre-preg/adhesive film materials.

The company is using a similar design for the latest Clyde STA built for South Australia. Prototypes are being produced for European builders to replace conventional doors in interurban stock with examples already running on Scandinavian and European railways.

The aluminium honeycomb sandwich construction ensures an extremely stiff and lightweight door leaf structure with no exposed fasteners, and is tailored for optimum characteristics and a durable service life.

The expertise demonstrated in composite door leaf design has been extended into applications in both structural and furnishing elements for rail vehicles. Designs exist for upper deck floors, carbody roof panels, access doors, partitions, ceiling, luggage racks, internal partitions and spandrels.

Beclawat's composite products go from basic board stock to fabricated components and as on all their products a full design and technical service is available to render assistance to designers on either composite materials or side and end-face glazing.

The company is now poised to further penetrate the export arena with what they believe to be world standard products.□

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CityRail's $450m signals upgrade

Liverpool, on the main southern railway line 35 kilometres from Sydney has been chosen as the site for CityRail's first computer-based signalling interlocking system. The existing signalling utilises a 70-year old mechanical lever frame, with colour light and semaphore signals, that is in need of replacement.

Studies also indicate that rationalisation of the track layout will improve operation of trains and reduce costs.

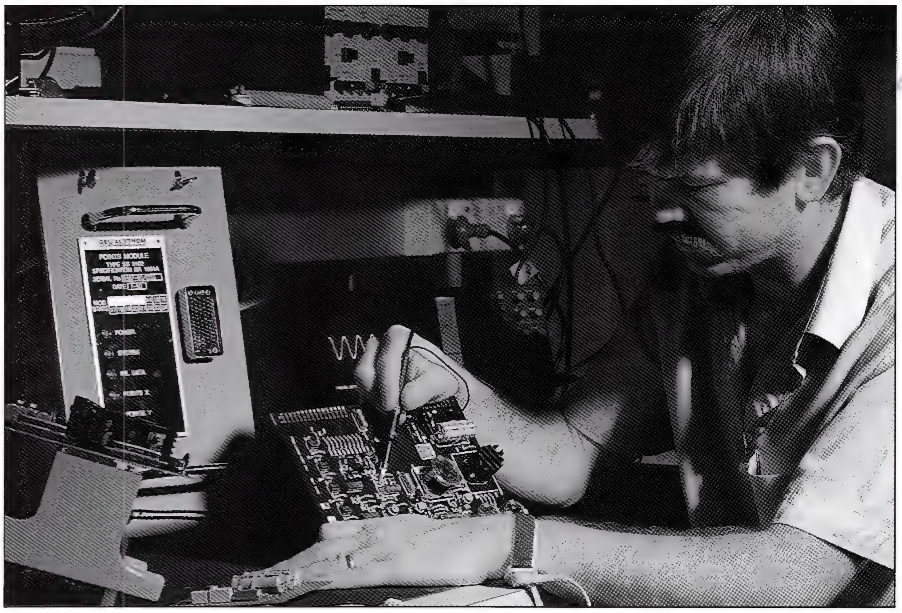
The signalling covers 15 points, 31 signals, 65 routes, one releasing switch and a three-track level crossing. The existing route set relay interlocking, three kilometres away, at Cabramatta Junction, will be retained and remotely controlled from Liverpool.

The project involves a $4.5m contract with GEC Alsthom, part of a $450 million CityRail program, for the resignalling and computer-based signalling equipment.

CityRail is undertaking the track layout remodelling, power supply upgrading, stageworks and provision of long lead time signalling equipment (impulse and audio frequency jointless track circuits and point machines) giving a total project cost of $12 million.

The track layout remodelling cost $3.3 million was completed by December 1991.

The GEC Alsthom contract will take 54 weeks and will be commissioned in August 1992. Control of Liverpool and Cabramatta will initially be from a push button panel located at Liverpool. At a later date CityRail will interface the Liverpool signalling to a train describer system being installed at Sydneham, which will ultimately be controlled from the single CityRail control centre.



A TECHNICIAN AT GEC ALSTHOM CHECKS THE EQUIPMENT WHICH WILL REVOLUTIONISE SIGNALLING ON CITYRAIL'S MAIN SOUTHERN LINE.

LIVERPOOL HAS A KEY ROLE TO PLAY IN THE MODERNISATION PROGRAM.

CityRail required full safety validation of the computer based signalling interlocking system.

The GEC Alsthom offer provided the British Rail approved "Solid State Interlocking" system. This system has undergone an extensive validation process, independent of the design team. The results of this validation are fully documented.

The contract provides for technology transfer to CityRail and will involve extensive training courses for CityRail design engineers and maintenance staff. The provision of a full copy of the validation documentation and a detailed review of the documentation is also part of the CityRail system safety plan for the project.

CityRail requires high levels of quality management for the contract

THE COMPUTER BASED SIGNALLING INTERLOCKING SYSTEM, TO COST $4.5 MILLION, HAS BEEN TRIED AND PROVEN WITH AN EXTENSIVE SAFETY VALIDATION PROCESS INDEPENDENT OF THE DESIGN TEAM.

and GEC Alsthom are implementing formal quality procedures to cover their work. GEC Alsthom are using a sub-contractor in Sydney, to manufacture the solid state interlocking equipment in Australia. In line with the project quality standards the sub-contractor has received formal accreditation from Standards Australia for AS3902 *Quality Systems for Production and Installation.*

The contract scope of work covers the design, manufacture, supply, installation, testing and commissioning of the solid state interlocking and all trackside signalling equipment, a signalling control room, apparatus housings, cable routes and power supplies.

Solid state interlocking

Solid State Interlocking (SSI) was developed in the early 1980's under a tripartite agreement between the British Railways and two major signalling companies including GEC Alsthom Signalling Ltd of the United Kingdom. To date more than 100 interlockings have been installed in nine countries around the world.

The acceptability of SSI equipment has been assessed on the basis of technical and safety requirements, cost effectiveness, proven use with other railways, proven equipment performance and reliability, and the local engineering and support capability to successfully complete the contact.

As the first computer based signalling interlocking system on CityRail, the Liverpool contract includes provision of a design workstation, spares, test equipment and extensive technical and maintenance training. The main benefits provided by the new technology are:

- ☐ Ease of installation
- ☐ Reduced space requirements
- ☐ Reduced lineside cabling requirements
- ☐ Improved fault finding and diagnostics
- ☐ Suitability for remote operation and monitoring
- ☐ Ability to fully test the interlocking design on a simulator.

The equipment for the resignalling of Liverpool will include a central SSI cubicle, containing the signalling interlocking logic, panel processor modules and diagnostic processor modules. This equipment is located in an equipment room adjacent to the control room at Liverpool.

A technicians maintenance terminal which provides comprehensive diagnostics will also be located in the equipment room. The signalling interlocking logic will be contained on three processors, operating in a two out of three multiple redundant configuration to provide a high level of system integrity, safety and operational availability.

The design of the SSI system provides for a mean time between system failure (MTBSF) of over 400 years.

The system controls from the central processors are transmitted to trackside equipment via a high integrity data link in a duplicated configuration. There are signal and point trackside function modules that interface the control information from the data link to the actual signals, points, and trackside equipment. These trackside function modules also accept indications from track circuits, signals, and points, and transmit this information, via the duplicated data link, to the central processor equipment.

The interlocking, panel and diagnostic processors will be programmed to carry out the signalling interlocking and logic functions required for the particular geographical track layout and signal arrangement. The preparation of the data is carried out on an off-line design workstation, the requirements of the signalling control table logic provided by CityRail.

The off-line design workstation also includes an SSI simulator to enable full functional testing of the signalling interlocking design in the confines of the signal design office. This ability greatly simplifies on-site testing and commissioning of the overall system.

The signalman will be provided with a conventional entrance and exit route-setting push button console. This interfaces with the control and indication system via dual panel multiplexers. Interfacing to a train describer computer is planned in the future to facilitate centralised control. $450 million is to be spent on the CityRail signal renewal and modernisation program in upgrading the signalling infrastructure.

World interest

The computer based signalling interlocking is an element of the use of new technology, and cost effective solutions to achieve the program's objective.

CityRail has adopted a rigorous approach to the introduction of computer and communications technology into safety-critical railway signalling functions.

The investigation started with the issue of a pre-qualification document to potential suppliers of computer based signalling interlocking systems. Suppliers from Britain, Europe and the USA responded. Following a review of overseas installations by three CityRail engineers and evaluation of the pre-qualification responses, contract specifications were issued for the resignalling of Liverpool.

These specifications stressed the need for a system with proven service and full safety validation.

Because of the complex nature of the system a structured approach was adopted for the specifications and the corresponding evaluation. The procedure follows the Kepner Tregoe Decision Analysis methodology and offered advantages in following a pre-determined course from project concept to award of contract. During the tender evaluation and the recession-induced re-assessment of capital funding of public works, the State Rail Authority and the New South Wales Government maintained the commitment to the CityRail signal renewal program and the introduction of this technology. ☐

Children from West Leederville Primary School, Perth, try their new electric train.

Perth goes electric — and loves it

Timetabled electric train services commenced in Perth late last year. The first two trains were placed in service on the Armadale line after a two-year electrification program which meant a complete reconstruction of the suburban rail system.

The new EMU electric trains replace diesel locomotives which hauled the suburban passenger trains for many years.

"Magnificent," said Westrail commissioner Dr Jim Gill as the first new electric train came into regular timetable service. "The EMU's have proved themselves far more reliable than we anticipated and it could well mean that we are able to phase in more electric trains faster than originally planned."

Feedback from passengers was also positive with many people reporting their satisfaction to Transperth

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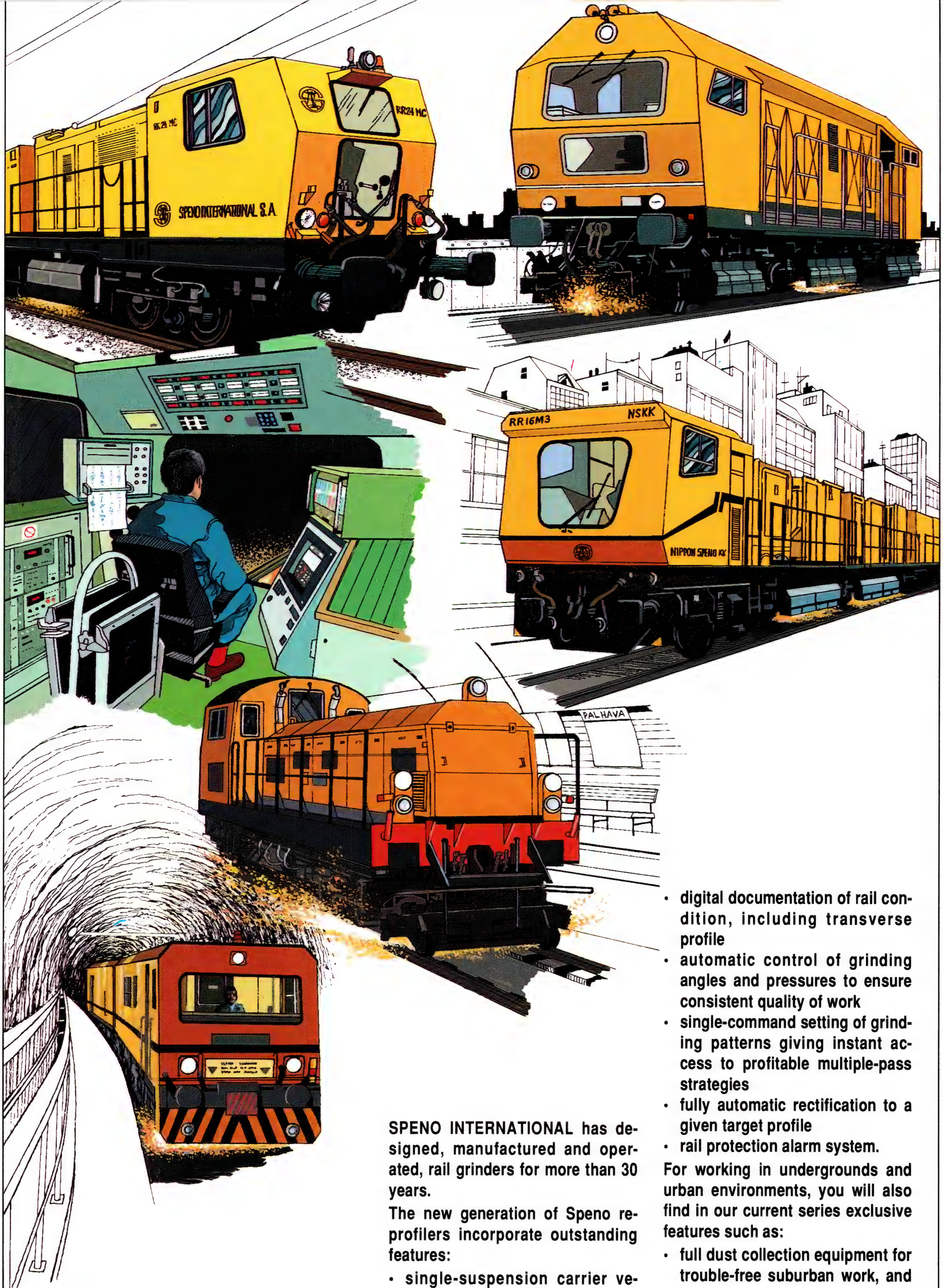

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Western Australian Premier, Carmen Lawrence, aboard Perth's new Emu train suburban service with driver Gerry McIntyre.

staff at the Royal Show display. The trains' first revenue-earning services were to the Show when two sets were used as a shuttle between Perth station and the showgrounds.

They proved so popular that some two-car sets designed to carry 312 were filled with up to 450 passengers, with some happy to sit on the carpeted floor.

Before the show demonstration runs began, the WA Premier Dr Carmen Lawrence and Transport Minister Pam Beggs showed one of the new trains to the media and took the opportunity to announce the date of the first service to Armadale.

Dr Gill said: "I congratulate and thank all the staff in this successful and popular new service. Thanks also to our unions for their constructive efforts in bringing it about."

Raising the roof

Meanwhile, work on extending Perth station to make room for the Northern Suburbs line is well underway with extensions to the space frame roof beginning to take shape. The space frame is being assembled on the ground and lifted into place in six sections.

Designed and built by contractors, the space frame and roof will cost $500,000.

Said project engineer Kevin Guppy: "This year we will start on the new platform. The new number nine platform is being built to accommodate Fremantle to Midland trains which currently use platform six and seven."

The new platform will be 115 metres long, big enough for a four-car set of EMUs. There will be a new set of escalators and a lift as well as the existing staircase and the Roe Street frontage will be extensively landscaped.

Kevin said the work was programmed for completion in time for the opening of the Joondalup line. The Northern Suburbs Transit System will revolutionise transport in the rapidly growing northern suburbs. When it is completed to Joondalup in late 1992, it will provide a fast, world-cass system of public transport with great benefits for the many thousands of people who have made the northern suburbs their home.

The Northern Suburbs Transit System is part of the Western Australian Government's overall strategy of modernising Perth's commuter services. Other components of this $440 million strategy are the electrification of the three existing rail networks — the Fremantle, Armadale and Midland lines — and the new airport-style bus station.

The Northern Suburbs Transit System is being planned jointly by Westrail and Transperth, and being constructed under Westrail's management with participation by many of Perth's consulting engineers, architects and other specialists.

Westrail has begun work on the $260 million state-of-the-art electric railway between Perth and North Joondalup. The 29 kilometre railway will mostly occupy the median strip between the northbound and southbound lanes of the Mitchell Freeway.

More than $160 million is being spent on earthworks, bridges, railway stations, power supply, and communications and signalling equipment.

Another $100 million is being spent on the 22 two-car electric trains, each of which can carry 312 passengers.

Workers will start to lay the track progressively from Perth to Joondalup early this year. This way most materials for the new track can be railed to the site. This will help limit disruption on the motor freeway during the construction phase.

Joondalup station construction work will finish in September, 1992. This station is set in the heart of Joondalup City. The platform will be in a cutting with the rail tracks about six metres below ground level. The station design has maintained a light and open quality by leaving the area above the platform open.

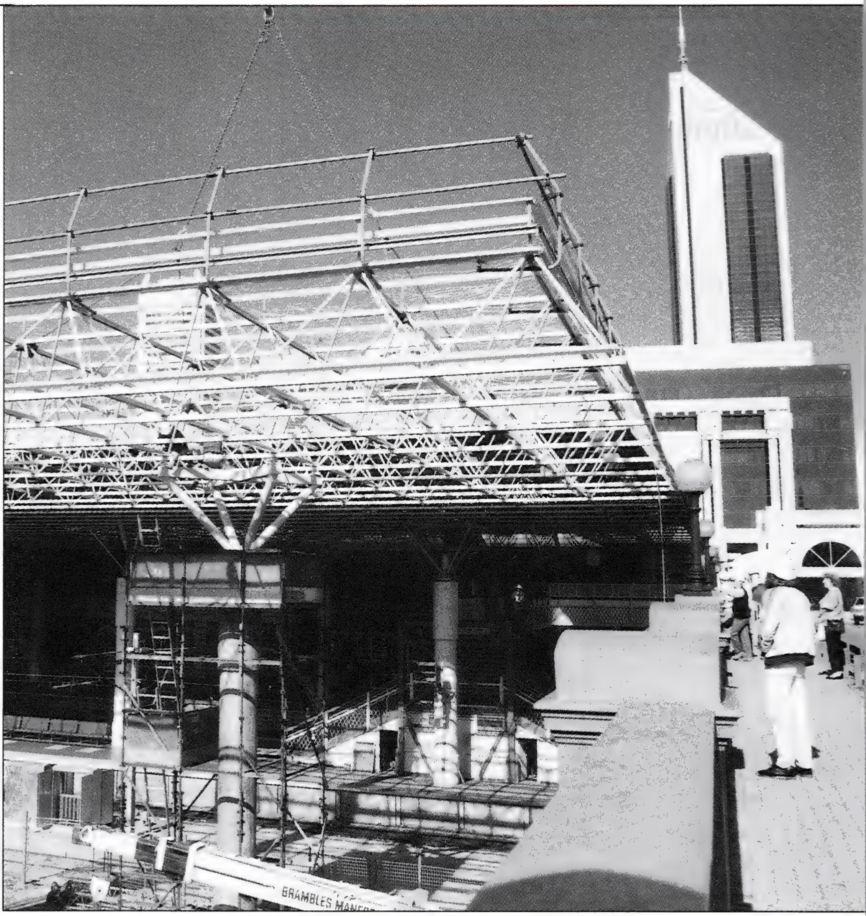
There will be a space for 14 buses to set down passengers. The platform will be 120 metres long with provision for future extension north.

At the city end of the new line a new platform (number nine) is being built on the Roe Street side of the tracks. It will be linked to Wellington Street by the existing pedestrian concourse. There will also be new pedestrian access from all platforms, at the western end, to the nearby bus terminal.

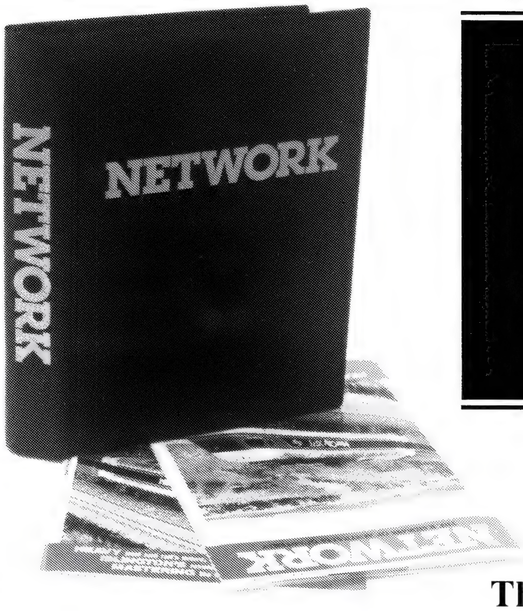
The final stages of this project, expected to be finished later in 1992, will include a piazza, landscaping, escalators and retail outlets.

Work on the $8 million, 130 metre Roe Street tunnel in Northbridge began last year. In a first for WA, the walls are being constructed using interlocked secant piles which provide a membrane between the soil and the tunnel.

After the walls are completed the floor will be poured, then the roof structure put in place. Because the floor of the tunnel is below the water table, a dewatering system is being installed. There will be 250 metre ramps at each end of the tunnel. ☐



First of the new space frame sections is lifted into place at Perth railway station.



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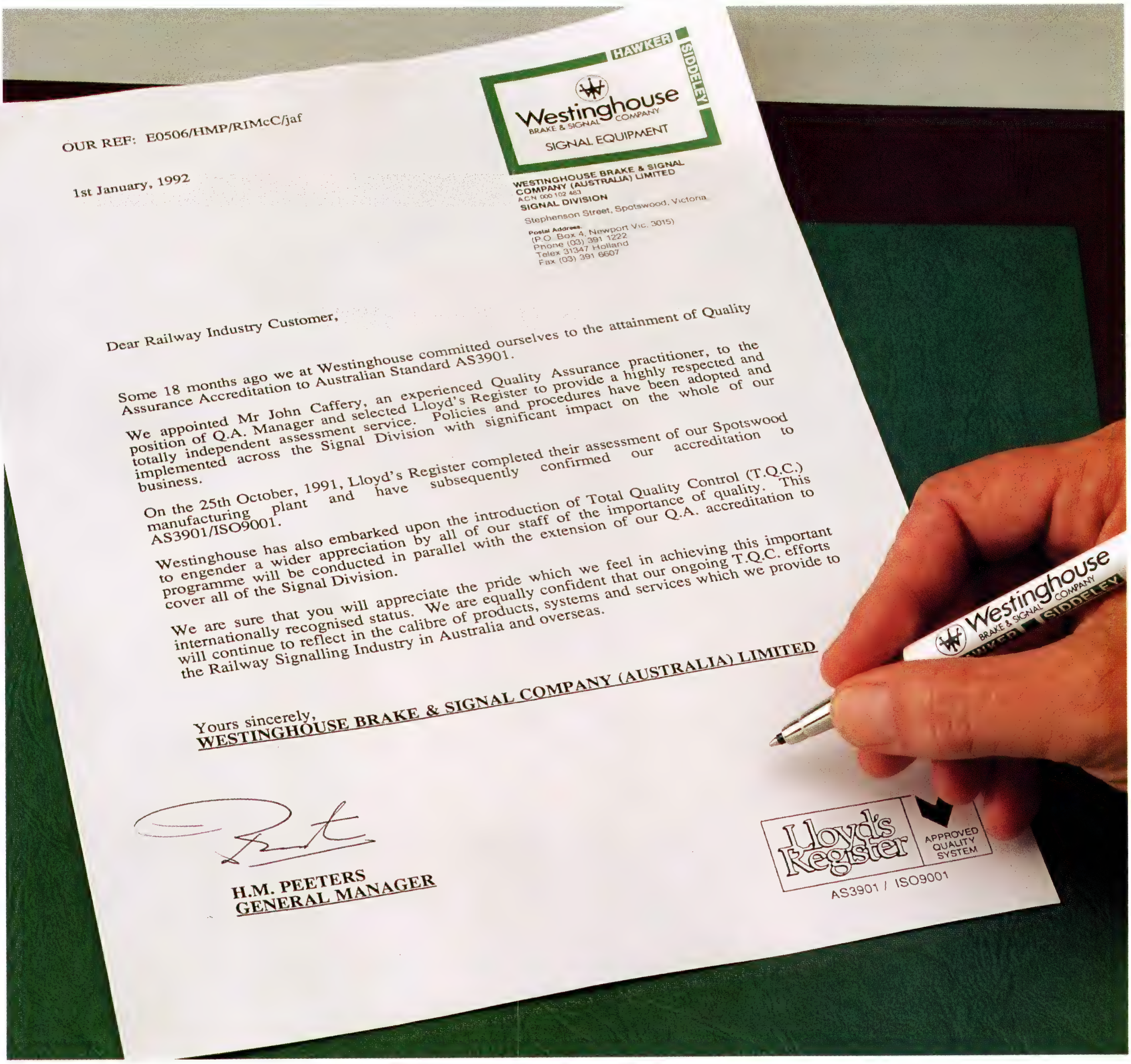

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1st January, 1992

Dear Railway Industry Customer,

Some 18 months ago we at Westinghouse committed ourselves to the attainment of Quality Assurance Accreditation to Australian Standard AS3901.

We appointed Mr John Caffery, an experienced Quality Assurance practitioner, to the position of Q.A. Manager and selected Lloyd's Register to provide a highly respected and totally independent assessment service. Policies and procedures have been adopted and implemented across the Signal Division with significant impact on the whole of our business.

On the 25th October, 1991, Lloyd's Register completed their assessment of our Spotswood manufacturing plant and have subsequently confirmed our accreditation to AS3901/ISO9001.

Westinghouse has also embarked upon the introduction of Total Quality Control (T.Q.C.) to engender a wider appreciation by all of our staff of the importance of quality. This programme will be conducted in parallel with the extension of our Q.A. accreditation to cover all of the Signal Division.

We are sure that you will appreciate the pride which we feel in achieving this important internationally recognised status. We are equally confident that our ongoing T.Q.C. efforts will continue to reflect in the calibre of products, systems and services which we provide to the Railway Signalling Industry in Australia and overseas.

Yours sincerely,
WESTINGHOUSE BRAKE & SIGNAL COMPANY (AUSTRALIA) LIMITED

H.M. PEETERS
GENERAL MANAGER

Lloyd's Register
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For more information:
WESTINGHOUSE BRAKE & SIGNAL COMPANY (AUSTRALIA) LIMITED
SIGNAL EQUIPMENT Stephenson Street, Spotswood, Vic. 3015. Tel: 03 391 1222 Fax: 03 391 6607

A GREAT COMPANY IN GREAT COMPANY

SYD-MELB XPT SERVICE 1993

The new Sydney-Melbourne XPT service, due to commence mid 1993, has moved closer to reality with tenders invited for the preliminary designs to expand the XPT service centre at Sydenham, five kilometres south of Sydney.

Countrylink in New South Wales is investing $11 million in the expansion of the centre which will include an automated train washing facility and an effluent treatment plant.

The new facilities will provide a faster turnaround period improving on-time running. The Service Centre currently services Countrylink's fleet of XPT trains providing daily services to Brisbane, Murwillumbah, Tamworth, Dubbo and Albury.

It carries out inspections and repairs on XPT's and operates 24 hours a day.

The XPT's will run both daylight and overnight XPT services, between Sydney and Melbourne.

SÉCHERON LTD TAKES HASLER

Sécheron Ltd has taken over the Hasler Measuring Equipment Division from the group Ascom Holding. This division ranks as the world's leading supplier of systems for measuring and recording speed. Its products and systems, which are exported to more than 60 countries will continue to be marketed under the name Hasler.

The activities of the division have been transferred to a new company, Sécheron Hasler Ltd., in Bern, Switzerland. The new company is an affiliate of Sécheron Ltd which is principally involved in developing and manufacturing electro-mechanical components for railroad rolling stock as well as DC power supply and circuit protection systems.

As a result of this acquisition, Sécheron becomes one of the world's leading suppliers of components and equipment for railroad rolling stock.

WESTRAIL'S FIRST COMMERCIAL PROFIT

Westrail has recorded its first commercial profit of $1.6 million for the 1990-91 financial year on its freight operation. Income for the year rose $23.3 million to $366.7 million while expenditure was up $8.2 million to $365.1 million.

The rise in expenditure was held below the inflation rate, despite major increases in fuel prices.

"It is especially pleasing for Westrail because the profit has been achieved in the face of very difficult market conditions for most of our clients, particularly in the mining and agricultural sectors," Commissioner of Railways, Dr Jim Gill, said. "It has also been achieved following the de-regulation of most commodities carried in W.A. This result shows that Westrail can compete against road transport and do it profitably."

MARKET HERE SECOND HIGHEST FOR AMTRAK

Australia ranks second to the United Kingdom as a market for Amtrak national rail pass sales. Amtrak is the United States of America's passenger railway system. It operates through travel agencies in 46 countries.

Last year the sale of Amtrak national rail passes in Australia rose by 15.5 per cent.

The pass, which can only be purchased outside the USA by international travellers, allows unlimited stop-overs on Amtrak's 40,200 kilometre system for 45 days.

From January this year high and low-season prices will apply. High-season fares apply between 22 May and 15 September 1992 and the national pass will cost about A$447. During the winter, spring and autumn low-season the price will drop to about A$383.

QR'S TRADING IMPROVES

Queensland Rail posted a significantly improved result for 1990/91 enabling its overall deficit to fall by $24 million to $109.4 million. Chief Executive Vince O'Rourke said: "This is an encouraging result bearing in mind major summer flooding throughout northern and central Queensland caused an estimated shortfall of $60 million."

Freight haulage was 82.97 million tonnes creating a new record for an Australian railway. Coal railings of 68.4 million tonnes were marginally up on the previous year. The line expects to be hauling more than 100 million tonnes of coal annually within seven years.

Rises in bulk load dedicated trains, distillate, beef and cement also contributed to the record freight haulage.

Country passenger journeys increased by 14.5 per cent to 803,000, largely because of a boom in patronage on the Cairns-Kuranda Scenic Railway. The total number of passengers statewide was nearly 43 million.

"Passenger services provided only 5.7 per cent of total revenue," said Mr O'Rourke.

Leaving the Melbourne yards by steam train for Geelong.

STEAM RETURNS TO THE MAIN LINE

On each of Australia's railways, a small number of steam locomotives remain. Maintained, for the most part, by volunteers under the supervision of qualified railway inspectors, they are used on special occasions – historical events, and charter trips for their enthusiast owners and maintainers.

Formerly the backbone of all Australian traffic, they were displaced from regular service many years ago by modern diesel and electric locomotives. But they generate nostalgia, and have a tremendous appeal for members of the general public.

Steam locomotives require special driving and firing skills, and the train crews who operated them in regular service have, in most cases, retired. How to fill this gap?

Public Transport Corporation, Victoria, decided to train extra crews by using steam locomotives on a batch of regular trains.

They chose the third-term school holiday period, and the Melbourne-Geelong line, as the time and venue. For two weeks, the regular 10 a.m. Melbourne-Geelong V/Line train, and the 1.30 p.m. service in the other direction, were hauled in turn by one of the three remaining R-class 4-6-4 "Hudson" type locomotives, first introduced to Victoria in 1951.

A total of seventy R-class were built in Scotland, and were designed to haul fast passenger trains on the State's main lines. The advent of diesel-electric later in the fifties meant that the R-class had a short service life.

The three remaining active members of the class are in fine condition, as their recent performances demonstrated.

The 10 a.m. "down" service makes only two intermediate stops, and is 84 KPH = 52·6 MPH!! allowed 52 minutes for the 73 kilometre journey. The 1.30 p.m. "up" makes seven stops, and has a 65-minute 45.6.5 Miles schedule.

= 42·1 MPH

The "Hudsons" ran to time on most of the "down" journeys and were only minutes slower on the "up" (diesels typically accelerate more quickly than steam locomotives – so that keeping to schedule on "stopping" service is more difficult). There were no other problems, and the locomotives 71.8·5 maintained 115 km/h comfortably. MPH

Popular? Well, the regular composition of these V/Line trains is three passenger carriages. On the first day, the size of the train was doubled. And, for the last trip, ten carriages were !! filled to over-capacity, and hauled as a 450t "farewell" gesture by two R-Class in tandem. (!)

Revenue boomed, and *Network* understands that V/Line may repeat the training program during future school holiday periods.

30 YEARS OF STANDARD GAUGE TO WODONGA

The standard gauge railway from Melbourne to Wodonga celebrates its 30th birthday this year. "The gauge is Thru' in '62" was the ~~catchery~~ slogan for the opening of this important section of the Melbourne to Sydney line.

It was the first major railway construction work commenced following the end of World War II.

The line marked the beginning of the Wentworth Plan, a modified program to standardise Australia's main line railways, and to provide a uniform gauge link to all mainland capital cities. This goal has now been achieved.

The Melbourne to Adelaide direct link, however, remains broad gauge (1600mm).

Plans are in hand to celebrate this 30 years of standard gauge from Melbourne to Wodonga and may include the operation of a steam-hauled passenger train between Melbourne and Sydney during the Easter period. Further details are available from Mr D Doherty, 285 East Street, Albury NSW 2640.

AUSTRALIAN TO HEAD WORLD ORGANISATION

A leading transport executive from Sydney, Mr Allan Hibble, has been elected President of the International Council of The Chartered Institute of Transport, London.

The Institute has 21,000 members with major branches in Australia Canada, Hong Kong, India, Ireland, Malaysia, New Zealand, Pakistan and Singapore and the United Kingdom.

There are 2,500 individual members in eleven separate sections throughout Australia.

Mr Hibble is the first president elected outside Great Britain and Ireland and will serve for two years. A former merchant seaman, he holds Foreign Going Masters Certificate. He came ashore in 1956 to settle in Sydney.

Elected a Fellow of the Institute in 1971 and an active Committee member since that date, he was Chairman of the NSW section of the Institute 1985-86 and National Chairman in 1989-91.

He has been President of the Long Distance Road Transport Association of Australia and a member of the Council of the Australian Road Transport Federation and the Employers Federation of NSW.

TRACKLAYER'S 14 SLEEPERS A MINUTE

A major upgrading of 120km of track on the New South Wales north coast line is being carried out by a new Italian-designed tracklayer capable of laying 10,080 concrete sleepers in a 12 hour shift — that's 14 every minute.

There is limited time available on the the important Newcastle to Brisbane single line tack.

The machine travels from Telarah near Maitland during a four and a half hour 'possession window', cuts the railway line and lays 600 metres of concrete-sleepered track daily before packing up and returning to its siding, taking the recovered old timber sleepers with it.

XPT and guaranteed goods services can run over the newly-formed track immediately. The machine is currently contracted to State Rail by John Holland Contructions.

The track layer at work.

DOUBLE-STACK WELL WAGON WINS CIT AWARD

The well wagon, which allows double-stacking of full-size freight containers, has won the Chartered Institute of Transport's top award for Australian National which devised the concept.

The well wagon, recognised as the most innovative freight transport concept in the nation was awarded a bronze plaque.

The AN Islington freight centre's new streamlined gate entry system also received recognition in the 1991 Australian Transport Industry Awards.

A special commendation was given to the computerised gate entry system, judged equal third with a "Stockpile entry from the WA Coastal Shipping Commission.

The awards are made each year by the Chartered Institute of Transport in Australia for outstanding and innovative contributions to the improvement of Australian transport.

Reliable rollingstock is a vital key to AN's future success and the well wagon and associated 5-pack well set are designed to meet the growing need to shift more freight faster. Five well wagons permanently joined by a solid drawbar can each accommodate the double-stacking of two full-height containers, effectively reducing train lengths by about a third.

The new southern road access at the Islington freight centre incorporates three gatehouses electronically linked to a computerised weighbridge, giving Islington the ability to boost throughput at the entrance sixfold.

Sensors help the truck driver to centre his vehicle on the weighbridge and freight is processed through the Container Reservation and Inventory System (CRIS) computer network.

The awards reaffirm AN's position in Australia as a leader in the installation of state-of-the-art materials handling technology.

CATCH THE XPT – TO BRITAIN

(NSW GR)

A new promotional campaign launched by Countrylink gives NSW country rail passengers the chance to win a trip for two to Britain. Country residents who purchase a Countrylink ticket plus a Countrylink Sydney Pack and travel between 1 February and 18 March, automatically enter the prize draw for a Qantas Jetset holiday to Britain.

Countrylink has designed a range of Sydney Packs to entice country travellers. They are:

☐ *Nissan World Sevens* – A reserved seat for three days at the Sydney Football Stadium. Cost $46 (available from BASS outlets at $49)

☐ *Darling Harbour Super Ticket* – Entry to Sydney Aquarium and Chinese Gardens, two hour harbour cruise and a 10 per cent discount at participating harbourside outlets. Cost $29.50 Adult, $19.50 Child.

☐ *State Transit Sydney Pass* – Travel for three consecutive days with the Sydney Explorer, Darling Harbour Shuttle, plus unlimited journeys on the Manly Ferry, Zoo Ferry and Jetcat. Cost $39 Adult, $29 Child.

☐ *Royal Randwick Pass* – Entry to Randwick for the 'Queens Cup' buffet luncheon, bar and full tote facilities. Cost $60.

☐ *The Rocks Rock-it Pass* – Entry to Story of Sydney, cruise on Sydney Showboat, plus lunch at the Italian Village. Cost $29.50 Adult, $19.50 Child.

For reservations, passengers should visit or call their nearest Countrylink Travel Centre, railway station, Countrylink accredited travel agent or call Countrylink Reservations on toll free (008) 043 126.

PASSENGER PROFIT FOR NZ RAIL

New Zealand Rail Limited, a company formed by the NZ Government in October 1990 to run the rail freight, passenger and inter-island ferry services, has reported a profit on passenger operations in its first annual report.

The company's city rail service recorded around seven million passenger trips during the eight-months of the reporting period with the InterCity long-distance service carrying 215,000 passengers.

Unlike many overseas railways the passenger service operates on a straight out commercial basis without government subsidy.

Overall company net profit for the reporting period was $34 million. It is one of the few railways in the world outside the United States of America to make a profit free of subsidiaries and operating without protection.

WA WILDFLOWER TOURS BREAK 40-YEAR RECORD

In Western Australia, the wildflower season has just finished with Westrail carrying its largest number of clients in 40 years. Westrail, the marketing name of Western Australian Government Railways, operates 3, 5, 6, and 8-day wildflower package tours featuring the north, south and Esperance Coast areas.

travelers

Renowned for their high quality, Westrail's wildflower tours feature the services of a coach captain, botanical guide and tour hostess to ensure passengers receive the best in personal attention and in-depth knowledge of the spectacular wildflowers of Western Australia.

Having been a leader in the wildflower tour business for more than 40 years, Westrail is delighted with its 10 per cent increase in business.

1992 promises to be another milestone for Westrail when it introduces its new Scania 5-star road coaches to the wildflower tours.

For brochures, give Westrail Travel centre a call (09) 326 2159 or STD (toll free) 008 099150.

TASMANIAN RAIL'S FUTURE OPTIONS

The Bureau of Transport and Communications Economics (BTCE) has released Report 69, *The Future of the Tasmanian Railway System: A Cost-Benefit Assessment of Options*. The study provides financial and cost-benefit analyses of options for the Australian National (AN) railways operation in Tasmania (Tasrail).

With current financial support arrangements due to expire at the end of June 1993, the Federal Government referred the issue of the future of Tasrail to the BTCE.

The two basic options are closure, or retention with action to improve financial performance. For the retention option there are three scenarios considered, involving different rates of reduction in the Tasrail workforce and substitution of capital for labour.

The social cost-benefit analysis essentially estimates the value of the resources released to alternative uses if Tasrail is closed, less the value of the resources needed to perform the freight task by alternative modes.

Unpriced social effects of rail closure on the environment and redundant rail workers are discussed separately. The report is available for $16.95 from Commonwealth Government Bookshops.

Australian heavy-lift truck wins recognition

The Australian designed and manufactured Omega range of heavy forklift trucks has won increasing recognition for setting new standards in the railway and transport industry generally. They are used by the Victorian Public Transport Corporation (V/Line) and major rail freight forwarders.

Clark Equipment Australia drew on 20 years of heavy-lift truck design experience to create the Omega series. The major design parameters were established as:

☐ Capacities from 25 to 42 tonnes including Ro Ro models
☐ Modular components for ease of servicing and assembly
☐ Outstanding visibility
☐ Operator comfort
☐ Reliability and performance

The series now consists of nine models. The largest model, 48C, has a net capacity of 36 tonnes under the twistlocks of a 20-40 spreader whilst the newest is a unique 32 tonne low-profile unit designed for use on roll-on roll-off ships.

The modular design of the Omega appears to be a first in the industry. The seven basic modules are:

☐ The power module which consists of the radiator, engine, transmission and all hydraulic valves and pumps, mounted on an independent frame.

☐ The cab module which can be located in several positions on the frame, eg. left, centre or high mount.

☐ The electrical box which contains all electrical components such as relays gauges, timers, circuit breakers, etc., and is connected by individual plug in harnesses to all other modules.

☐ The other main components being the upright, drive axle, steer axle and frame.

Visibility on the Omega was designed to exceed the stringent requirements of the State of Victoria. Every component forward of the operator was located to minimise its impact on operator vision. This resulted in lift cylinders being totally hidden behind the upright rails and chains running down the front of the rails. All-round visibility is extremely good, due the Omega's low profile and the strut mounted overhead tilt cylinders.

The standard, fully automatic shift Clark transmission has resulted in not only less work for the operator, but increased reliability and performance as the unit is always in the correct gear for the demands placed on it. In addition, it totally prevents changes of direction unless the unit is brought to a complete stop, and upshifting if the unit is travelling too fast for the gear selected.

Also fitted as standard equipment is an engine protection and shutdown delay system. The engine protection system monitors water level, water temperature and oil pressure, while the shutdown timer ensures the engine is idled for three minutes even if the operator switches off. This prevents the turbo charger being starved for lube oil, and it dissipates heat from engine hot spots. An audio visual alarm system warns the operator of any malfunction or potential problem.

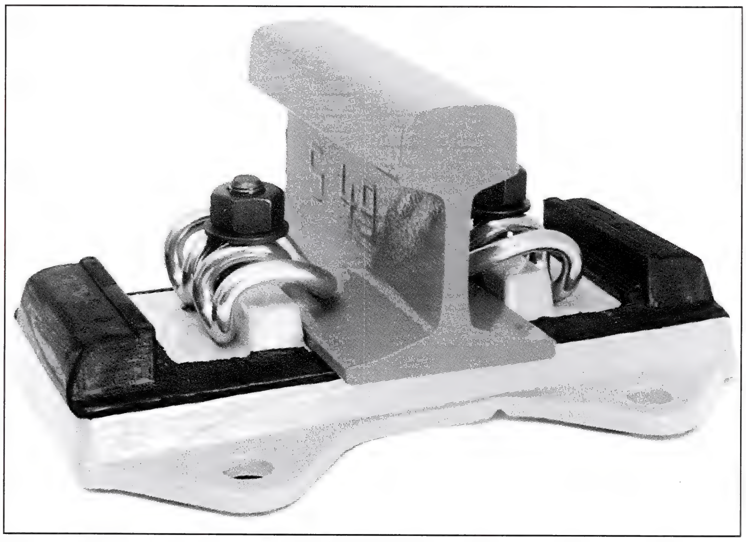
Full hydraulic powered dry disc brakes have eliminated the need for an air compressor on the Omega series and provide significantly improved braking and serviceability. Wet disc brakes are an option. Other service features that add to the reliability of the Omega are a centralised lubrication system on the upright rollers, and a unique built-in hydraulic test gauge which permits the six main circuits to be pressure tested.

There has been interest shown overseas with sales already achieved in New Zealand and Fiji. The recently-released 32 tonne Ro-Ro truck, of which two have been sold to Gateway Terminals in Brisbane, has generated a lot of interest due to its increased capacity over the traditional 28 tonne Ro Ro models.

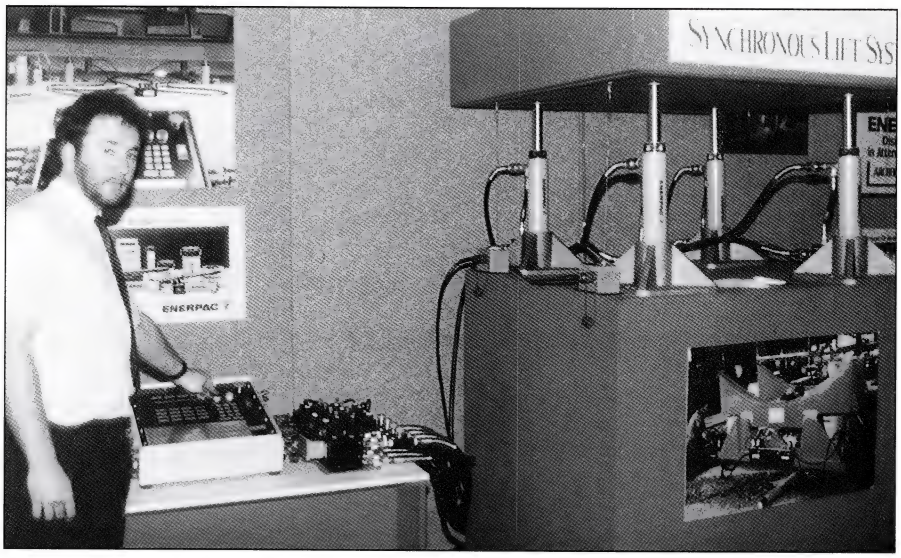
☐ ☐ ☐

NEW PRODUCTS & PROCESSES

Information and photographs about new products and services available from Australian companies serving the rail transport industry, particularly those relating to new technological developments, should be forwarded to the Editor, Network, GPO Box 2501V, Melbourne 3001.



The elastic rail fastener.



Enerpac's Paul Keegan and new lifter.

Elastic rail fasteners hold tight

A new style of elastic rail fastener designed to isolate the vibrations that cause groundborne and secondary airborne noise in tunnels, bridges and viaducts is being used for the first time in Australia by Westrail in a section of the $220 million Northern Suburbs transit system project.

The fastener, known as the Alternative (ALT1), has been (concrete) developed for direct fixing to hard trackbeds and eliminates the need for ballast and sleepers, greatly simplifying rail construction and ensuring virtually maintenance-free operation.

In total, 2770 Alt1 elastic rail fasteners will be used to fix 400 metre long dual rail tracks in Perth's first rail tunnel at Roe Street.

Designed by German company Clouth Gummiwerke AG of Cologne and manufactured under licence in Australia by Delkor Pty Ltd, the Alt1 is an integral unit formed by bonding a steel rail base plate and external mounting frame with vulcanised rubber. Because the rail base plate is completely separated from the mounting frame, lateral and horizontal forces are elastically absorbed by the rubber, significantly reducing the transmission of vibration into the tunnel floor.

Other benefits include a low (height) vertical profile which minimises the height of tunnel structures, accurate fixing which guarantees smooth running, increased rail life, and maintenance-free operation of about 30 years.

Enquiries: Delkor Pty Limited, PO Box 971, Bondi Junction, NSW 2002. Telephone (02) 387 6900. Fax (02) 387 7870.

Thousand tonne lifts at fingertips

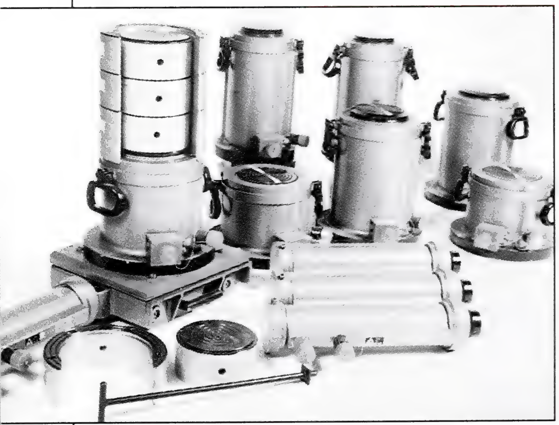
Australia has received its first demonstration of a new synchronised lifting system which allows one man to precisely control loads of up to several thousand tonnes.

The portable, microprocessor-controlled Enerpac system – displayed at the Aimex exhibition in Sydney recently – uses a single control unit to synchronise up to eight lift points, involving cylinders from 1-1,000 tonnes capacity, with a programmable accuracy of +/– 1mm.

It is designed to dramatically reduce the cost of heavy lifting by eliminating complex electronics, large work crews and complicated, time-consuming setups.

Enerpac's synchronous lift system uses only one pump. It has one valve manifold for each four lift points and one check valve package for each lift point.

For further information: Roy Coulson, national manager, Enerpac Division, Applied Power Australia, 29 O'Riordan Street, Alexandria, NSW 2015. Telephone (02) 698 9955. Fax (02) 698 9664.



Light-weight jacks from Railco.

Light-weight lifting jacks

A light-weight lifting system, which has revolutionised the method of jacking derailed locomotives and wagons, is now being widely used for civil engineering maintenance and emergency services.

The Hoesch MFD system has been recognised by railways in more than 70 countries. Formerly, the company's heavy, 164kg steel jacks required a 10-man working team.

Brian Stephens, managing director of Australian distributor Railco Pty Ltd, of Western Australia says the totally-integrated lifting system is ideal for areas where space is minimal, such as in bridge maintenance.

Hoesch MFD light-weight lifting systems ensures access where there is only limited head-room and space for two men to operate.

"Lifting capacity of the latest series of hydraulic jacks ranges from 35 to 120 tonnes; they weigh between 42 and 79kg and have a pancake profile from a mere 130mm up to 1030mm," he said. "Four jacks can be combined and operated from a control desk, providing a lifting capacity of 480 tonnes."

Distance from equipment, or machine to be lifted, presents no problem as hoses can be joined without loss of pressure.

"Accuracy is vital and all lifting, lowering, pushing and pulling movements can be operated to within one millimetre with this equipment," Mr Stephens said.

The jacks are fitted with a specially-designed hydraulic valve as a safety measure. If there is any problem with pump or hoses this valve ensures the load remains secure until the jack is retracted.

A video detailing the system and a new catalogue have just been made available to the Australian market.

Enquiries: Railco Pty Ltd, 19 Jesmond Place, Dianella WA 6062. Telephone: (09) 275 2388.

New Hyco reach stackers

Clark Equipment Australia has released two new model Hyco reach stackers, offering significantly increased capacities, improved operator visibility reliability, and performance.

The company says model HB146 is likely to prove the most popular in Australia, with a rating of 50 tonnes in the first row, or 48 tonnes under a piggyback spreader.

Another major feature of the new model is installation of a naturally aspirated Mercedes OM442 diesel engine, rated at 300 HP. The increased horse power and natural aspiration provide improved acceleration compared to the previous model which featured a turbo charged engine.

Hyco have released their own top lift and piggyback spreader, four of which have been under test for the past 18 months with the German Railways and other customers. The Hyco spreader features improved balance, lower stress design, and improved electrical, mechanical, and hydraulic reliability.

Improved operational features of the spreader include a high capacity rotation motor and brake, plus a unique large single dampening cylinder centre mounted to the front of the rotator. This cylinder has equal areas on both sides of the piston which ensure the pressures in the cylinder are balanced, thereby providing better dampening effect and reliability than other designs. It also ensures all forces on the rotator are balanced and for piggyback operation can be powered to provide longitudinal tilt.

All round visibility on the new models has been increased more than 30 per cent by redesign of the rear tower structure and increased width between the boom cylinders to permit full front to rear travel of the optional sliding cab. The exhaust system and air cleaner have also been relocated within the shadow of the rear towers, and the counterweight has been reprofiled to further enhance rear visibility and turning radius.

Three Hyco reach stackers are operating at Conaust's Fishermans Island terminal in Brisbane, the oldest having exceeded 5000 hours since its delivery in July 1990. According to Conaust's management, the Hyco's have provided outstanding availability. For further information: Alan Foulkes of Clark Equipment Australia Pty Ltd. Telephone 008 028 537.

BHP steel for QR wagons

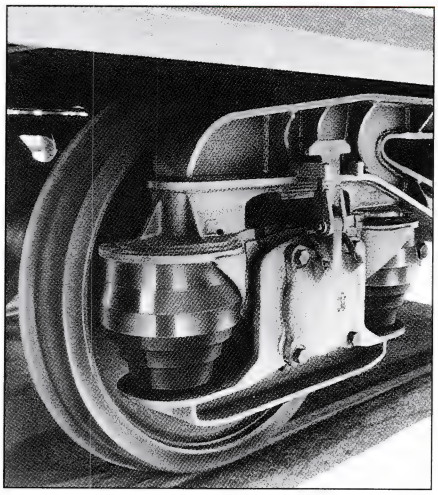
ANI Ruwolt at Karrabin has won a contract to supply Queensland Railways with 300 coal wagons manufactured from 3CR12 corrosion resisting steel from BHP Stainless Products. The new order follows the success in service of 242 VSNB 3CR12 coal wagons supplied earlier to QR.

ANI Ruwolt will commence supplying the wagons — at the rate of 10 per week — in mid-February 1992.

Around 1400 tonnes of 3CR12 will be supplied by BHP Stainless Products. Nearly 100 tonnes of this is being roll-formed into open channel sections for use as the top cant rail section of the wagons. This work is being undertaken by LBI's custom roll-forming department at Nunawading, Victoria.

Introduced to Australia ten years ago, 3CR12 is a low cost lean alloy ferritic stainless steel specifically developed to fill the gap between true austenitic stainless steels and coated mild steels.

Enquiries: Alan Gibbs, Market Development Manager, BHP Stainless Products, Five Islands Road, Unanderra NSW 2526. Telephone: (042) 71 6544, Fax: (042) 71 5127.



Less noise at higher speeds.

New spring for freight wagons

New primary and auxiliary springs for railway cargo wagons which help reduce noise, increase speed capabilities and curtail creepage problems are now available in Australia.

Continental Division Contitech's new Schwingmetall springs, a bonded, solid natural rubber and metal design from Germany, are being marketed here by Caminer Bros Pty Ltd, Sydney.

A major advantage of the new springs is that they can be designed and shaped for particular applications. They can be manufactured in different compositions to produce different performance and flexibility characteristics for each use, says Caminer Bros managing director Mr Eric Whiteley.

This means the bonded rubber/metal layers of springs can be "tuned" during construction to produce different damping and different vertical, horizontal and lateral stiffness characteristics, he says.

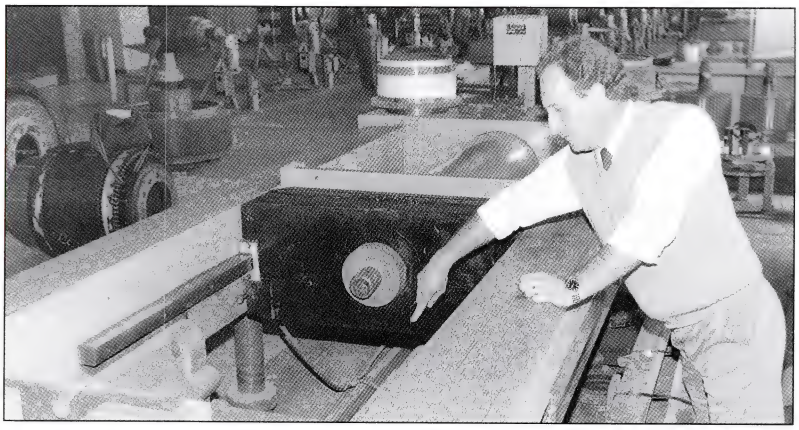
Contitech is a world-recognised research, development and production authority on rubber springing. Its springs are used on the French TGV and on the Deutschen Bundesbahn Inter-City Express.

"During my recent visit to Germany, Contitech engineers were working to further extend the performance of the primary springs in freight cars," Mr Whiteley said.

"In order to increase the speed, it was felt desirable to use damping devices across the primary spring to enhance control of the vertical rate of the spring.

"An in-built damping device within the primary spring which can control those vertical rates was developed. It incorporates hydraulic fluid in two chambers which are connected by a choke tube and which, I understand, can be changed to control the vertical frequencies."

Enquiries: Eric Whiteley, Caminer Bros Pty Ltd, Unit 9/98 Old Pittwater Road, Brookvale 2100. Telephone (02) 939 2499, Fax 939 2305.



The horizontal press for electric motors.

Press saves money and handling

A horizontal press used by the NSW State Rail Authority is helping government agencies and private customers save on the cost of refurbishing electric motors.

The press — powered by a 500-tonne capacity Enerpac cylinder — is used to swiftly and safely remove shafts from armatures typically weighing between 500 and 1,000kg.

Horizontal construction of the press — rather than the traditional vertical construction — facilitates access to workpieces.

Armatures are lowered into the adjustable press cradle by an overhead crane. Once positioned, collars and adaptors are used to accommodate different sizes of shaft. Enerpac valving and variable speed pump operation facilitates rapid positioning of the pressing cylinder's shaft against the armature shaft, which has been cooled with dry ice to facilitate withdrawal from the heated armature.

State Rail's electrical maintenance centre is the largest DC traction motor shop in the Southern Hemisphere. It handles motors ranging from more than 30 years old to the most up-to-date, including makes such as EMD, GE, AEI, Metropolitan Vickers, Mitsubishi and Hitachi.

The centre services more than 1200 traction motors and 130 main generator/alternators a year, of which nearly 400 are refurbished.

Enquiries: Roy Coulson, national manager, Enerpac Division, Applied Power Australia, 29 O'Riordan Street, Alexandria 2015. Telephone (02) 698 9955.

Signlite gets Perth contract

Suburban train stations and their associated park 'n' and ride facilities in Perth will be better identified following a $193,000 signs contract to Signlite Australia.

The company will manufacture and supply directional, identification and park 'n' ride signs at suburban stations on the Midland-Fremantle and Perth-Armadale lines.

Queens Park station has been selected as a trial for the new high-standard signs, which will be adopted throughout the Perth suburban passenger rail network.

REVIEWS

A modern mirror on the Australian rail experience

Steel Roads of Australia

By Colin Taylor

IPL Books, Sydney. $39.95

The experience of seeing ourselves in a mirror is sometimes a painful one as we grow older serving back to us in absolute truth the curious embellishments of more youthful years in strange harmony with the etched facade of modernity that has launched a thousand spaceships.

This book holds the mirror to Australian railway systems and recounts their oddities, absurdities and the technological innovations which have made Australian rail systems world leaders in many areas.

It is an important contribution towards seeing ourselves as we are now.

The text by Dr Colin Taylor, an associate professor in the Department of Geographical Sciences at the University of Queensland, is not extensive occupying only about 13 pages in a total of 144, but it is pertinent and good-humoured allowing us a smile at ourselves occasionally and inducing a certain feeling of incredulity every now and then.

Is he taking the mickey out of us or not? This is for the reader to judge.

Suffice to say that Colin Taylor sees in our railway systems all the human frailties of periodic surges of enthusiastic endeavour counterbalanced by years of lethargy and scant concern for the 21st century. A dedicated railway researcher and advocate he has made more than 600 journeys by rail in the past 14 years covering 160,000 kilometres across Australia.

His acknowledgment to achievement is found in the reference to Australian railways as world leaders in train air-conditioning, double deck trains, overnight trains with showers for sitting passengers, solar-powered signalling, and electric traction. Heavy mineral trains, he says, rival any in the world and the leading long-distance passenger trains offer a standard of luxury found elsewhere only on special cruise trains designed for the most affluent travellers.

The Tangara suburban trains of Sydney, he adds, are among the most modern in the world while The Ghan and The Queenslander are two of the world's finest long-distance trains unmatched anywhere by normal scheduled services.

In contrast, there is his rather unflattering review of current railway timetables and seat-booking arrangements listing 'through trains' that have never existed and buffet cars that appear to serve passengers long after the train has reached its destination.

However, if you want a concise picture of Australian railways as they are today – and why they are this way – then Colin Taylor's essay is a good one to whet the appetite, give you enough information to appear reasonably intelligent about the subject, and at the same time get you out of trouble with some humorous observations.

Towards the rear of the book there is a list of further reading suggestions.

So what about the remaining 130 pages or so? Well, they are occupied with visions splendid – coloured photographs of representative trains crossing bridges, traversing the plains with huge purple mountain ranges in the background, at suburban stations, meandering through picturesque hills and sugar cane fields in a kaleidoscope on a State by State basis.

Geoffrey B. Churchman was responsible for the art direction and took many of the photographs himself.

Steel Roads of Australia ISBN 0-646-05454-X from IPL Books, PO Box 1209, Sydney NSW 2001. Price $39.95 (approx.) Published November 1991. □

REVIEWS

Jane's World Railways

Edited by Geoffrey Freeman Allen

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Railway Technology International ISSN 0951 9645 from Sterling Publications International Limited, 86-88 Edgware Road, London, W2 2YW, United Kingdom. Fax 071 402 1468. ☐

TRACKS

Old engines get new lease of life

By J.C. BROWN

Manager Locomotive Engineering,
A. Goninan & Co. Limited

Mr J.C. Brown, BSc, PhD, is the Manager Locomotive Engineering, A. Goninan & Co. Limited. This article is based on a paper he presented recently to a railway engineering conference in Adelaide.
The conference was organised by The Institution of Engineers Australia, 11 National Circuit, Barton ACT, 2600. Telephone (06) 270 6555. Fax (06) 273 1488, which holds the copyright for all papers presented at the conference.

Twenty-four V/Line locomotives have been rebuilt, similar to this one passing the Terminus Hotel on the run from Wodonga to Melbourne.

The remanufacture of locomotives which have reached the end of their operating life has been proven to be a technically and economically effective means of fleet renewal. There is a range of different options by which life expired locomotives may be rebuilt and returned to service:

- ☐ *Locomotive overhaul* — teardown, major components overhauled or unit exchanged, reassembly and repaint.
- ☐ *Locomotive modernisation* — typically upgrading of crew facilities (e.g. adding new air conditioned operator's cab) in conjunction with overhaul.
- ☐ *Locomotive remanufacture* — reutilise the underframe and bogies (and other components) to effectively build a new locomotive with the latest technology traction system.

This article describes locomotive remanufacture, wherein a life expired locomotive is rebuilt in to a locomotive of entirely new specification. Economic, technical, operational and contractual issues are reviewed.

The article is based on experience from the recent remanufacture of locomotives for two iron ore mining companies of the Australian Pilbara.

Obviously many fleets of locomotives have been rebuilt and put back into service. Some recent examples are listed in Table 1. A comprehensive description of diesel electric locomotive rebuilds on Australian railways is covered by Eslick (ref 1).

This article defines a manufactured locomotive as one in which the rebuild scope of work includes a new traction package (diesel engine, traction motors, alternator, control system etc.) to the extent that the locomotive performance is significantly enhanced. Indeed the remanufactured locomotive is functionally identical to a new locomotive of the latest technology.

By comparison an overhaul or modernisation generally includes rebuild (or unit exchange) of the traction system components, in which case the locomotive performance is not

Table 1 — Summary of recent locomotive rebuild programs

RAILWAY	TYPE	QTY	BUILDER	NOTES
BHP Iron Ore Ltd (1)	Alco C636 to GE CM40-8M	4	Goninan	Remanufactured
Robe River Iron Associates	Alco C630, C636 & M636	9	Goninan	Remanufactured to GE CM40-8M
BHP Iron Ore (1)	Alco C636	8	Goninan	Remanufactured to GE C36-7M
Hamersley Iron	Alco C636 & M636	26	Comeng	Modernisation (new op cab, thorough electrical and mechanical overhaul)
V/Line	B Class GM ML2	11	Clyde	Remanufactured to A Class
V/Line	T Class GM G8B	13	Clyde	Remanufactured to P Class
NZR	DA Series GM Gl2A	80	Clyde	Modernisation to DC Class G22AR
NZR	DB Series GM G8A	10	Clyde	Modernisation to DBR Class G18AR

(1) — Formerly Mt Newman Mining

Table 2 — Comparison of Alco and GE CM40-8M locomotive performance specifications

LOCOMOTIVE MODEL	GROSS MASS	TRACTIVE EFFORT		GROSS POWER kW	TRACTION POWER kW
		CONT. kN	MAXIMUM kN		
Alco M636	190	403	595	2909	2686
GE CM40-8M	195	485	628	3119	3000

significantly altered from that of the original specification when the unit was first commissioned.

Therefore, locomotive remanufacture offers the railway an intermediate option between end-of-life overhauls and new locomotive acquisitions. The issues to be considered are economic, technical and operational.

The advantages of remanufacturing over overhauling are improved performance, latest-technology operational systems and better warranty, albeit at a higher cost.

A remanufactured locomotive offers the same performance as a new locomotive, but at a lower cost. However, the technical feasibility and economic viability of reconfiguring an existing locomotive is the first decision milestone.

First in the Pilbara

A. Goninan and Co. Limited pioneered the locomotive remanufacture concept in the Australian Pilbara region.

In 1987 Alco C636 locomotives were remanufactured to GE C36-7M specifications, and since that time Alco C630, M636 and C636 locomotives have been remanufactured to the latest GE Cm40-80M technologies for BHP Iron Ore Ltd (formerly Mt Newman) and Robe River Iron Associates (refs 2,3).

Table 2 summaries the performance differences between the life expired Alco C636 locomotive and its reincarnation after remanufacture as the GE CM40-8M locomotive. The remanufactured locomotive performance is identical to a new GE locomotive.

A typical scope of work for these projects, broken down to the locomotive major components (refer to figure 1) is summarised in *Table 3*.

The technical issues

The principle technical issues when considering the potential for cost effective remanufacture relate to the underframe and the bogies.

☐ *Underframe*

The suitability of the underframe structure depends upon its original structural design for fatigue life (stress versus number of cycles), integral strength after modification to support the new equipment configuration and weight on its top deck, and the end loads the railway specify for future operations.

Detailed design calculations using computer generated finite element techniques are required where structural modifications are made to suit the remanufactured locomotive's new equipment configuration.

The remanufacture of Alco to Dash 8 locomotives requires some significant alterations to the underframe, mainly around the control compartments beneath the operator's cab (refer to fig 1). the different bogie-to-underframe interface configurations of the C636 and M636 also warrant separate sets of detail stress calculations.

The Alco underframes, after repair, inspection and alteration are recambered.

The structural integrity of the Alco underframes is sound for the remanufactured locomotive's extended life, due very much to the heavy weight of the original locomotive in conjunction with the structural engineer's design methods of twenty years ago.

The application of powerful computer finite element methods today enables more accurate and exacting strength-to-weight ratio design of locomotive underframes.

Nevertheless, it is a high priority that the railway and remanufacturer carefully study and research the locomotive models which are considered suitable for a remanufacture program, and in cases of derailment and accident history the individual road numbers themselves.

In particular, light-weight locomotives may require expensive underframe strengthening to extend their fatigue life, and significantly reduce the economic advantages of remanufacture.

Bogies may be re-usable

Where the locomotive weight does not change radically, and the original bogies are of satisfactory design in ride quality wheel life and track forces for their application, there are major economic advantages in their reuse.

Fatigue life of the frame and underframe-to-bogie interface is then a most important issue as also is suitability to accommodate the new traction motors and wheelset assembly.

Remanufactured Alco locomotives have been equipped with GE 752AG (plain support bearings) and GE 752AH

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(low maintenance roller support bearings) traction motors and wheelset assemblies. Alco bolstered bogies and Dofasco 4 pad bolsterless bogies have been reused.

Where it would be proposed to utilise a different bogie the redesign work becomes very significant. The engineering task would be virtually as great as if it were a new design, but it may still be economically justifiable based on lower material costs than new, and improved locomotive performance.

Provided a reused component's performance, integrity and suitability of the job is commensurate with the remanufactured locomotive's performance specification, the economic advantages are only enhanced.

The air brake system is probably the most significant. Since standard systems have remained essentially unchanged for many years, it makes good sense to reuse brake valves. Exceptions to this would be for introducing specific, new valves, such as a desktop brake control valve to the operators cab, or if the very latest developments such as electronic brake systems were justified.

The operating issues

The disadvantage of a locomotive remanufacturing program over that of new locomotives is that the old model to be remanufactured has to be taken out of revenue service. Obviously the same situation exists if the locomotive were to undergo major overhaul.

In any case, the down time can be minimised through competent project management, and in particular, modular design of the remanufactured locomotive. In this way cabs and equipment can be built remote from the underframe and bogies, ready to be assembled in the shortest possible time when the locomotive ceases revenue service.

Time in the works can be as short as three months.

New locomotives technologies offer significant advances over those of 10 to 20 years ago in fuel efficiency, tractive effort and adhesion, reliability and computer based operating data (ref 4).

Justifications for locomotive fleet acquisitions take this into account, often achieving locomotive unit reduction ▶

A RE-MANUFACTURED LOCOMOTIVE OFFERS THE SAME PERFORMANCE AS A NEW ONE, BUT AT A LOWER COST.

THE TECHNICAL FEASIBILITY AND ECONOMIC VIABILITY OF RECONFIGURING AN EXISTING LOCOMOTIVE IS THE FIRST DECISION MILESTONE.

Table 3 — Typical remanufactured locomotive scope of work

LOCOMOTIVE COMPONENT	NEW OR REUSED	WORK SCOPE
BOGIES	Reused	Overhauled, frame repair a necessity. New piping, cabling, rubber components, bushes etc.
WHEELSET	New	New wheels, axles, traction motors, traction motor support etc.
FUEL TANK	New	Overhauled, top removed, internally cleaned and inspected, top replaced.
UNDERFRAME	Reused	Overhauled, surveyed, sand blast, NDT. Modified to suit new locomotive equipment.
DIESEL ENGINE	New	Complete with all auxiliaries (water cooling system, lube oil system, fuel system, air intake system etc.)
TRACTION EQUIPMENT	New	Complete with alternator, rectifiers, switchgear, traction motors and dynamic brake.
CONTROL SYSTEM	New	Latest technology Dash 8 microprocessor control, traction control, diagnostics system, data logging etc.
ELECTRICAL EQUIPMENT	New	Contractors, control electronics, switchgear and all cabling.
AIR BRAKE SYSTEM	Reused New	Overhaul brake valves, air driers, receivers etc. as appropriate, or replace with new. Motor driven compressor. All piping and fittings.
AUXILIARY EQUIPMENT	New Reused	Blowers, air filter systems etc. Railway specified auxiliary systems such as radio equipment, fire extinguishing system etc. may be overhauled and reused or supplied from new.
OPERATORS	New	Redesigned to the latest operator environment specifications in conjunction with the railway (eg air conditioned clean cab layout, incorporating latest driver interface equipment).
SUPER-STRUCTURE CABS	New	Cabs, canopies and support structures designed as appropriate for the new locomotive equipment configuration.

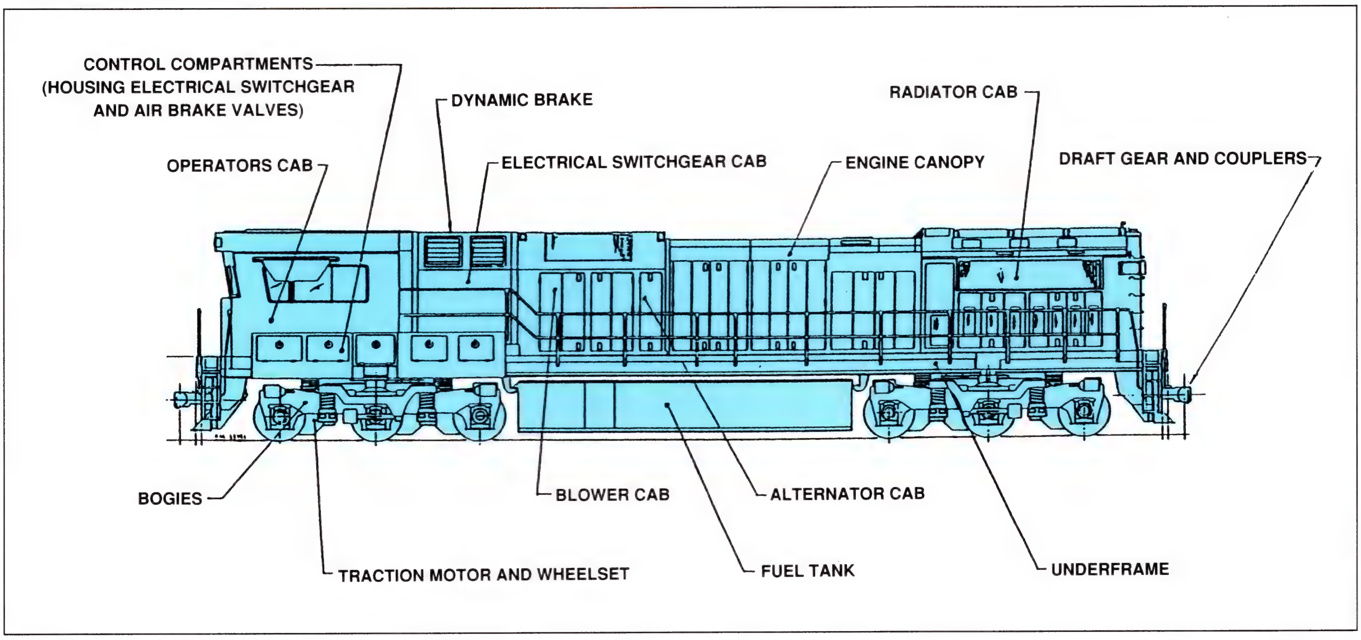
CONTROL COMPARTMENTS (HOUSING ELECTRICAL SWITCHGEAR AND AIR BRAKE VALVES)
DYNAMIC BRAKE
RADIATOR CAB
OPERATORS CAB
ELECTRICAL SWITCHGEAR CAB
ENGINE CANOPY
DRAFT GEAR AND COUPLERS
BOGIES
BLOWER CAB
ALTERNATOR CAB
TRACTION MOTOR AND WHEELSET
FUEL TANK
UNDERFRAME

Fig. 1 — **Remanufactured dash 8 diesel electric locomotive configuration**

based on these improvements. The additional economics of locomotive remanufacture should also be taken into account since it does not detract from the advantages of new traction technology.

The economic issues

Remanufacture of locomotives is an economic option between major overhaul and new locomotive purchase.

Compared to a new locomotive, remanufacturing offers a saving of between 15 per cent and 30 per cent, depending on the extent to which equipment, such as fuel tank, air receivers, brake valves etc may be reused.

The justification exercise for locomotive remanufacture over major overhaul is based on exactly the same arguments as buying new technology equipment, i.e. fuel efficiency, higher tractive effort, lower maintenance, fleet unit reduction, lower whole-of-life cost etc.

The bonus over new locomotives, however, is the lower capital expenditure and possible options to allocate the cost of those items being reused into operating or maintenance budgets. Another advantage of remanufactured locomotives over major overhaul program is the warranty provisions which cover the complete locomotive.

A remanufactured locomotive fleet will also reduce the inventory redundancy which accompanies new fleet acquisitions since certain components are reused (refer to *Table 3*).

Contract administration

Specifications and work scopes can be generated to define a remanufactured locomotive contract to the mutual satisfaction of both parties.

In particular, provided detailed scopes of work for the reused equipment are agreed upon up-front, given certain assumptions of the state of that equipment, costly surprises when the old locomotive is disassembled are minimised, and procedures for such events are described within the contract.

In some instances it makes economic sense for the railway to repair and overhaul certain items of equipment themselves, and supply them to the principal contractor for installation into the remanufactured locomotive. Again, provision for this can be made up-front in the contract.

In summary, there is no reason why contract administration should be any more complicated, or the transaction any more risky to either party, for a remanufactured locomotive compared to a new locomotive.

This article has described locomotive remanufacture, wherein a life-expired locomotive is rebuilt into a locomotive of entirely new performance and specification. The principle advantage to the railway in a remanufactured locomotive program is the opportunity to acquire new locomotive technology at lower capital cost than buying brand new locomotives, without compromising the performance or whole-of-life cost of the locomotive fleet.

The feasibility of remanufacturing a given locomotive model depends on the fatigue life of the underframe and its suitability for alterations to suit the new equipment configuration. Availability of a suitable bogie for reuse is also critical.

The successful remanufacture and operating service of the Pilbara Alco locomotives to GE Dash 7 and Dash 8's is an excellent example of this program, displaying the economic advantages, technical feasibility contractual reality and operating advantages. ☐

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A triangle of skills

A 50-tonne gantry crane in Australian National's motive power centre maintenance area gently lowers a locomotive onto its bogies which have been rotated to ensure even wear.

A few minutes from the huge Islington freight centre in South Australia, where Australian National's rail freighters originate and terminate, is Dry Creek a modern sophisticated maintenance depot for rolling stock where a new motive power centre handles locomotive repair, servicing and component replacement.

One Spot depot is there, too, to handle running repairs and modifications to the wagon fleet.

Islington has its workshops and so does Port Augusta to handle repairs to components which are then returned to stores at the Dry Creek complex. It is this geographical triangle of expertise, skills, and professionalism which enables AN to carry more freight with fewer and more reliable rolling stock.

During the 12 years from 1978 to 1990 average locomotive productivity (including shunt work) lifted 128 per cent and average wagon productivity (including service wagons) rose 234 per cent.

This was achieved with an ongoing dramatic reduction in fleet size. Wagon numbers were more than halved, from 12,200 in 1978 to 5,600 in 1990 and the number of locomotives cut back by a third, from 328 in 1978 to 233 (including 76 narrow gauge locomotives operating in Tasmania and on Eyre Peninsula) in 1990.

As the hub of AN's locomotive maintenance operations, the task of the new motive power centre is the quick and efficient mechanical overhaul, repair and service of AN's 157 locomotives involved in mainline and shunting operations on mainland Australia.

The goal is to boost locomotive availability from 80 per cent to 90 per cent through maximum performance gained from streamlined maintenance operations. Some of AN's new DL-class locomotives are averaging 70,000km every three months. The aim, through improved reliability, is to boost that figure to around 80,000km.

Some AN wagons are running over 200,000km a year, with the occasional unit clocking up an impressive 300,000km a year.

▶

> ‘Australian National has developed courses with TAFE which train staff for locomotive maintenance and offer skills of value to other industries.’

▶

Since the opening of the One Spot wagon repair depot at Dry Creek in January 1988, AN has had the highest rolling stock availability of all mainland rail systems. It has consistently matched and bettered the 94 per cent availability level set by Railways of Australia. The goal now is to lift rolling stock availability to 97 per cent.

Loco servicing geared for the future

Construction of the $13.2 million Motive Power Centre began in July 1989 with funding from a $20 million Federal Government grant for the modernisation of workshops designed to improve efficiency and cut costs.

The MPC ended the expensive, time consuming practice of splitting standard and broad gauge locomotive maintenance operations between Port Augusta and Islington workshops.

It is at the forefront of streamlined locomotive maintenance, repair and servicing operations which will carry Australian railways into the 21st century.

The MPC is the hub of AN’s mechanical servicing operations, complementing the nearby One Spot wagon repair depot and bogie exchange centre and close to the Islington Freight Centre and Dry Creek North marshalling yards. Incorporating multiskilled staff, engineering and technological innovation, efficiency is the key to the MPC, which began operations in December 1990.

Workshop staff in the MPC complex (electricians, fitters and boilermakers) are trained as locomotive maintainers, merging both mechanical and electrical skills for greater versatility. The work is association with multiskilled workshop assistants and draw from a flexibility of knowledge and skills which enables them to handle a wide variety of tasks — anything from replacing an engine to operating a crane, changing brake blocks or accessing the store computer.

The MPC Quick-Fix area gives AN the ability to fuel, sand, check oil and water, change brake blocks and make minor repairs to a locomotive within 30 minutes. With four-man shifts operating around the clock, the Quick-Fix area is geared to handle up to 40 locomotives a day.

The maintenance area at the MPC, staffed by some 90 multiskilled and support employees, carries out major service and repair work on around 15 locos a day. The aim is to reduce the downtime of a loco in for major repairs to little more than a week.

AN has developed courses, in association with TAFE, which not only trains its staff in how to maintain locomotives but also offer skills which are of value to other industries.

The One Spot wagon repair depot

Manned by a multiskilled workforce, the One Spot wagon repair depot at Dry Creek handles the repair and maintenance of AN’s 5,600 strong freight wagon fleet. The depot is complemented by the Round House at Port Augusta which carries out similar operations.

Since One Spot began in January 1988 the average out-of-service time for wagons under repair has dropped from seven days to one day.

The introduction of One Spot has enabled AN to consistently achieve annual wagon availability of 94 percent and above. Some wagons in the field are doing as much work in a year as they previously did in five years.

One Spot and Round House carry out running repairs on wagons on a component exchange basis — essentially the replacement of parts subjects to greatest wear, including wheels, bearings and bogies. Components are then sent to the workshops for reconditioning.

Both facilities also handle the installation of constant sidebearers with which AN is currently upgrading its wagon fleet to lift running speed from 80km/h to 110km/h or higher.

Components for the constant contact sidebearer installation program are made at Islington and Port Augusta workshops, including the welding of sidebearer pockets in bogie bolsters.

Wheel sets are removed from freight wagons at both depots and sent to the wheel shop at Islington workshops to be turned back to true round on the Hegenscheidt portal wheel lathe. Reconditioned wheel sets are then returned to One Spot and Round House for installation.

Wagons needing major crash repair work or rebuilds are handled at Port Augusta and Islington workshops.

The One Spot and its associated flying gangs (the front line troops in wagon maintenance operations) repaired more than 9,000 wagons in 1989/90. Some 4,550 wagons passed through One Spot and flying gangs repaired 4,580 wagons in metropolitan rail yards.

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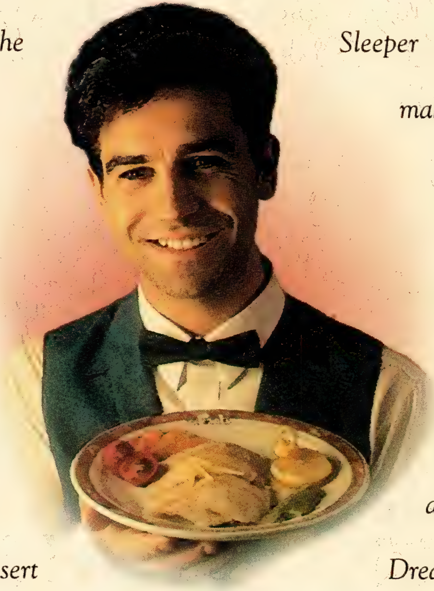

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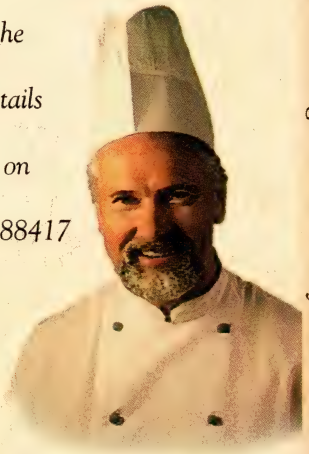

THE GHAN

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The wheel shop's computerised equipment streamlines precision wheel boring and lathing. Traction motors lined up for repair at Islington's locomotive component shop. A mono-rail handling system carries a load of clean bearings from the wash. Cleaning a locomotive prior to servicing is done on a pre-wash cement apron adjacent to the main motive power centre complex.

Flying gangs carry out on-the-spot repairs in the field without removing wagons from trains, putting them back in traffic as quickly as possible. With three shifts a day, five days a week, operating out of One Spot, the flying gangs patrol rail yards in vehicles equipped with air compressors, welding and maintenance equipment.

Three dual gauge access tracks feed One Spot, with each featuring a "one spot" work station where all equipment and materials needed by wagon repairers is easily accessible. The work stations are complemented by 150 tonne hydraulic jacks capable of lifting a wagon for bogie removal in less than a minute and six electric jib cranes (two per access track) for the dismantling of bogies and the movement of components and equipment.

The Port Augusta Round House

The Round House is AN's other major wagon repair facility, handling standard gauge traffic. Supported by a flying gang which patrols the Spencer Junction marshalling yards, the Round House carried out more than 2,750 wagon repairs in 1989/90.

As well as general wagon maintenance, it handles heavy repair work, keeping the Leigh Creek coal wagon fleet running smoothly. Part of the $3 million Port Augusta workshops upgrade is the installation in the Round House of a new electric overhead crane system for lifting components and equipment.

Tanker wagon facilities at the Round House are being upgraded to enable the cleaning, repair and pressure testing of AN's tanker fleet and tank wagons owned by other companies. Tankers must be steam cleaned and certified free of explosive gases before any welding or repair work is carried out.

The new facilities are expected to be operational in 1992, handling oil, petrol, diesel and acid tankers.

Islington workshops' three areas

Islington workshop has undergone a $9 million modernisation program to improve the work environment, boost productivity, cut costs and centralise workshop operations previously scattered over several hectares.

Three key areas handle locomotive component, bogie and wheel set overhaul and wagon fabrication and modification — the wheel shop and locomotive component shop located in the erecting shop, and the fabrication shop where wagons are built.

There is a cross-flow of reconditioned parts such as wheels and gears between the wheel shop and gears between the wheel shop and the locomotive component shop. The Fabrication Shop handles the repair, construction and modification of freight wagons, including the conversion of obsolete box cars to grain hoppers.

The shop specialises in the fabrication and construction of new-technology freight wagons — RoadRailer towing frames, 5-pack and well wagons — with the work split between Islington and Port Augusta fabrication shops.

Islington provides pressings and details for the assembly of wagons in both shops — equipped with new heavy fabrication machinery, including a profile steel cutter, hydraulic guillotines for cutting sheet steel, metal rollers and a giant press capable of exerting 1000 tonnes of pressure for shaping 25mm thick plate steel.

These workshops are supported by a foundry which casts steel and iron components and a sheetmetal shop which makes and repairs components for locomotives and wagons including reconditioned radiators and heat exchangers.

Port Augusta workshops is undergoing a $3 million upgrading program, set for completion in 1993, which is boosting efficiency and output. The overhaul centre, fabrication shop, and passenger car maintenance shop handle locomotive engine overhaul, wagon fabrication including crash repairs and passenger carriage overhaul and modification.

These workshop areas are supported by the engineering shop, which provides machine tool and plant maintenance services.

The wheel shop reprofiles wheels and reconditions wheel sets for rolling stock and locomotives based at Thevenard and Port Lincoln, working the narrow gauge Eyre Peninsula network. Equipment update has included modern machinery such as five new remote controlled overhead electric cranes, new locomotive component cleaning machines and work station based specialised lifting equipment for dismantling diesel engines.

The new-look locomotive overhaul centre features a new 25-tonne crane used for lifting and moving locomotive engines and components. At this centre is a light diesel engine and alternator overhaul bay which handles small alternator overhaul and the repair of AN's portable power electric generators.

The portable generators vary in size from small units which power on-site electric tools to large, on-train generators and units that can power a small town, used in base camps along the Trans Australia and Central Australia Railways.

The fabrication shop carries out wagon repairs, modifications and the building of 5-pack and well wagons in association with the Islington Fabrication Shop. The shop has the ability to handle a variety of modification work, including that carried out on triple deck car carriers, double deck cattle wagons and Big John cake hoppers.

Two new 25-tonne electric cranes have been installed for use in modification and construction work, lifting freight wagons and materials. New metal working machinery and access pits will aid staff on the job at centralised work stations.

The fabrication shop handles wagon repairs beyond the capacity of the Port Augusta Round House, which is involved in running repairs, some body work and tanker maintenance. Major crash repair work on standard gauge locomotives, freight wagons and passenger carriages can also be carried out at the shop, with the broad gauge crash repairs dealt with at Islington Workshops.

Passenger car maintenance shop operations are being boosted with the installation of two new 32-tonne electric cranes used to lift passenger cars on and off their bogies and move them down the shop from work station to work station. There are also plans for a new trolley-mounted automatic "robot" spray cleaning machine for cleaning passenger car undercarriages.

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SPECTACULAR EVENING VIEW OF AUSTRALIAN NATIONAL'S MOTIVE POWER CENTRE AT DRY CREEK, SOUTH AUSTRALIA. THE MAINTENANCE AREA ON THE RIGHT OPERATES AROUND THE CLOCK.

LOWER PICTURE SHOWS A WELDER AT ISLINGTON WORKSHOPS HELPING TO BUILD A NEW GENERATION OF AN'S AWARD WINNING WELL WAGONS WHICH CAN CARRY CONTAINERS PIGGY-BACK STYLE.

The Tasrail connection

Australian National's mainland fleet maintenance operations are complemented by similar narrow gauge services in Tasmania. AN Tasrail's 60-strong locomotive fleet and some 730 freight wagons are supported by Launceston-based maintenance and servicing facilities at East Tamar Junction and Invermay Road. The $1.2 million One Spot wagon repair depot at East Tamar Junction began operations in November 1988 and handles efficient, speedy wagon repairs with a small nucleus of multiskilled staff.

Based on maximum four-hour turn around per wagon for running repairs the depot, manned by six multiskilled employees, handled 1,176 wagon repairs in 1989/90.

Running repairs handled at the One Spot include replacing worn wheel sets, changing bogies, and minor repairs to underframes, couplings, brake gear, steps and handrails. The staff also handle some derailment repairs and minor modifications.

Wagon movement through the depot and underfloor jacks are operated from a centre console. Wagons are pulled into position by a cable. Work is carried out at "one spot" work stations, complemented by adjacent jib cranes, bench facilities and component store.

Wagons needing major repairs or modifications are currently sent to the wagon maintenance shop at Launceston workshops, Invermay Road. The diesel shop there handles major locomotive repair and maintenance operations while the fabrication shop, where wagons are built and modified, complements work carried out at the One Spot depot.

These key maintenance areas are supported by a wheel shop where wheel sets are serviced and assembled, a machine shop which handles steel machining like the honing out of axle boxes and air brake cylinders, a blacksmith's shop which manufactures new components and a panel shop specialising in panel repairs and sheet metal work.

The tremendous advances which have been made in recent years in the maintenance, repair, and fabrication of railway rolling stock at Australian National provide a spearhead to lead the way towards faster and longer trains around Australia in the future.

A flexible supply for DC traction systems

A DC traction system usually is fed through stationary rectifier substations erected along the track. Asea Brown Boveri in the past, has designed and manufactured successfully a number of such substations of various ratings for the Public Transport Corporation in Melbourne as well as for the State Transport Authority of South Australia.

However, special circumstances such as those listed below lead to requirements which can only be fulfilled by a mobile substation able to satisfy the following requirements.

☐ Feeding a line end that could be moved somewhere else later.
☐ Feeding a line being subject to long duration works such as installation of a new stationary substation, or repair, maintenance or modification to an existing stationary substation.
☐ Temporary back-up in feeding a particular line.
☐ Operation on sites with different HVAC supply systems (6.6kV, 11kV or 22kV).
☐ Adaptability to various sites in terms of AC & DC connections (underground and/or overhead).

With the capabilities intrinsic to the group, ABB were well placed to rise to the challenge of designing and manufacturing mobile substations for the Public Transport Corporation, Melbourne, which have all the design parameters as well as the electrical and mechanical features of a modern substation while simultaneously meeting the requirements of flexibility in such applications for DC traction systems.

These latest mobile substations, with a high degree of Australian content, serve as a shining example of ABB's strong commitment to local engineering, manufacture, and back-up services. Each of them is mounted on a low loader trailer designed for ease of transport to various sites within the Melbourne metropolitan area and can either be operated while on the trailer or demounted.

Each substation comprises the following equipment housed in its respective cubicle, and arranged for optimum functionality.

☐ AC HV switchgear incorporating withdrawable vacuum circuit breaker for protection of the main transformer and rectifier.
☐ A multi-ratio cast-epoxy resin main transformer equipped with a microprocessor based temperature monitoring device.
☐ A 6-pulse withdrawable truck mounted silicon diode rectifier including high speed fuses.
☐ A filter cubicle which includes a smoothing reactor.
☐ An auxiliary control cubicle that includes all the low voltage (240VAC & 48VDC) control equipment as well as facilities for low voltage back-up supply.
☐ A negative return cubicle which houses heavy interconnection copper busbars between the main transformer and the rectifier.
☐ A supervisory cubicle incorporating PTC telemetry equipment for remote control of the substation.
☐ Two DC feeder cubicles comprising each an UR36 withdrawable truck mounted high speed DC circuit breaker equipped with:
☐ A leakage test and auto-reclose device (IWX 129) for testing and catenary conditions.
☐ A line fault detector (DDL BDA 12o) for remote line fault detection.

Both DC feeders feature electrical interlocks to prevent racking in and out of a closed circuit breaker as well as accidental contact with the 600VDC conductors.

TECHNICAL CHARACTERISTICS

Electrical		**Mechanical**	
Rated Power	1800 kW	Trailer Weight	7.5T
Rated Voltage at Full Load	600 VDC	Substation Weight (without trailer)	21.3T
Rated Current	3000 ADC		

Overall Dimensions

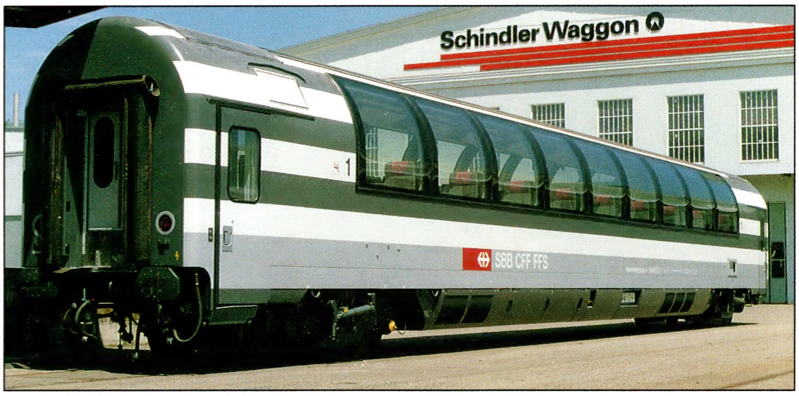
Substation (without trailer)		Substation (including trailer)	
Height:	3250	Height:	4300 mm
Width:	3400 mm	Width:	3400 mm
Length:	10550	Length:	14050 mm

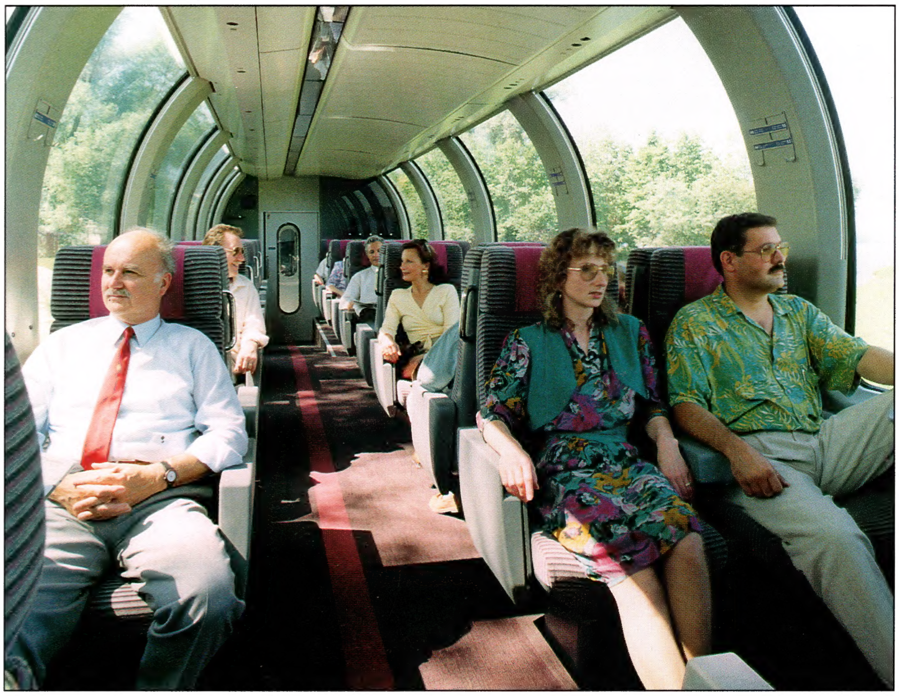
The ABB mobile supply is suitable for use in any DC traction system such as tramways and suburban rail systems. To date in Australia the PTC in Victoria has been the major user its latest purchase being last year when it acquired two mobile rectifier substations rated 1800 kW 600V DC.

Each of these has MV switchgear, rectifier transformer, silicon rectifier, filtering equipment, DC high speed circuit and breaker feeder panels. ☐

(Advt.)

A world first in panoramic windows





A new tourist car with large panoramic windows has become a world leader for Swiss Federal Railways (SBB). Never before have such large windows of this type been built for railway use.

The windows are about 19 metres in length by 1.6 metres in height with the individual panes interrupted only by narrow side-wall vertical struts.

The extra-large expanse of glass required a considerable amount of calculating work and trials prior to construction in order to test the structural stability of the panorama carriage.

The windows were developed and tested by Schindler Waggon Altenrhein in co-operation with a major Swiss glass manufacturer.

They must withstand the tremendous aerodynamic loads which occur when trains cross in tunnels at high speeds. Thermal and noise insulation properties are also important considerations for passenger comfort.

The windows are made of oxide-coated, sandwiched insulation glazing. Weighing 140 kg each they are bonded into the frame structure with high-performance silicone adhesive.

The basic concept behind this new panoramic vehicle generation is to offer passengers the experience of an unrestricted view of the scenic beauties of Switzerland and other countries in Europe.

This was achieved by raising the floor of the panorama carriage 45 centimetres above the height of conventional carriages and by the construction of outsize bowed windows.

The new carriages are designed for top speeds of up to 200 kilometres per hour and, thanks to their special equipment, are also admitted on foreign railway lines.

The air-conditioned interior offers 54 passengers outstanding comfort on individually adjustable first-class seats. Each seat has its own reading lamp which can be switched on separately, while on the corridor side a small table can be flapped up from the armrest. A wardrobe facility and baggage rack are available in the entrance area.

The cars will be used for cross-border service in tourist regions and will also be used on the Venice and Amsterdam lines.

Technical data

Overall length	26.4 m	86.59'
Width	2.825 m	9. 26
Height	4.26 m	13. 9
Capacity, 1st class	54	
Weight, tare	48 t	
Gauge	1435 mm	4. 7
Max. speed	200 km/h	

The panorama carriages were constructed by leading companies in the Swiss rolling-stock industry, with Schindler Waggon acting as main contractor and contracting party to Swiss Federal Railways.

The bogies were made at SIG Schweizerische Industrie/Gesellschaft of Neuhausen, and the electrical equipment by ABB Verkehrssysteme AG. The design of the panorama carriages immediately conveys the feeling of restrained elegance and spaciousness. ☐

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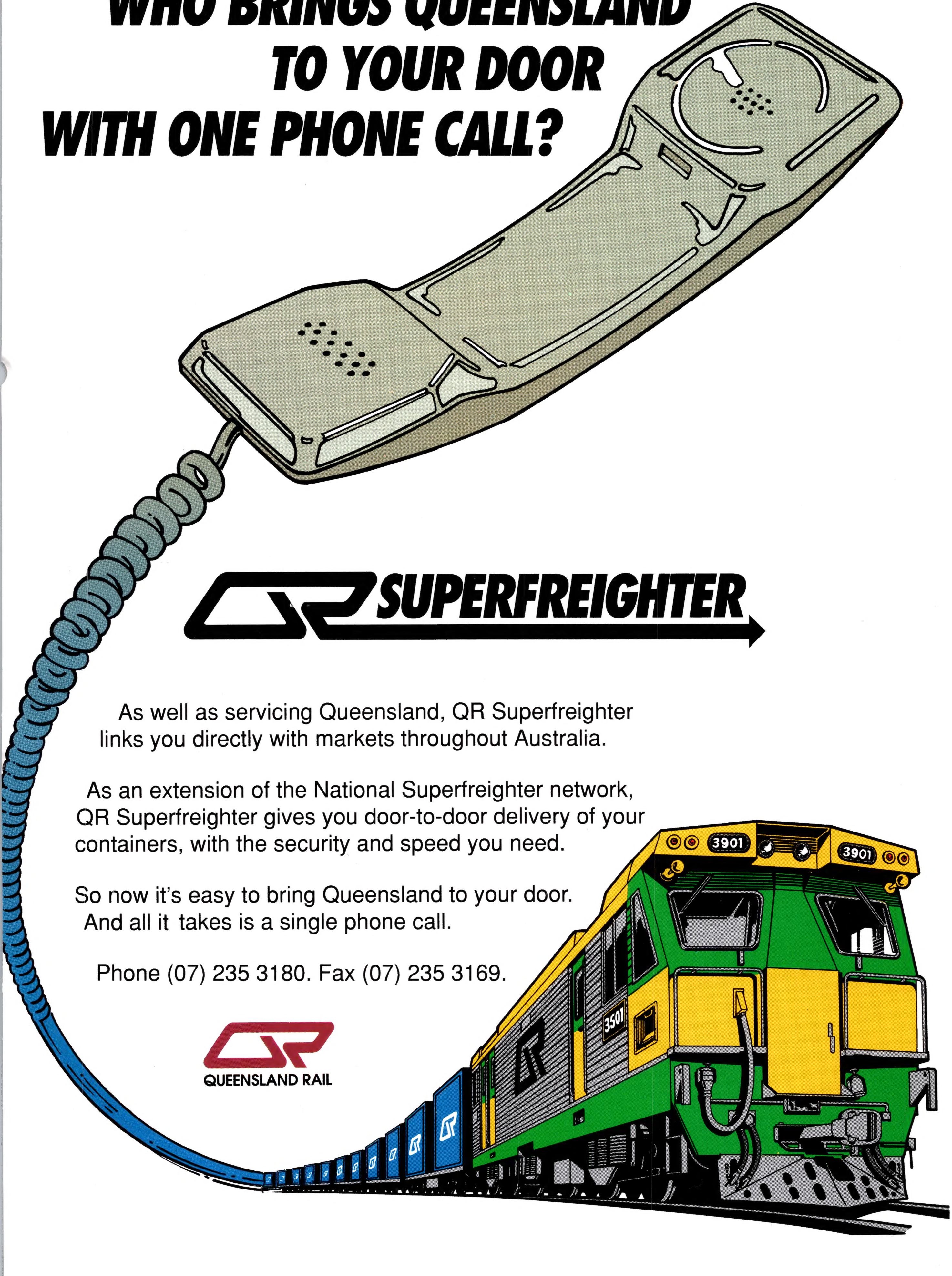

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